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THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

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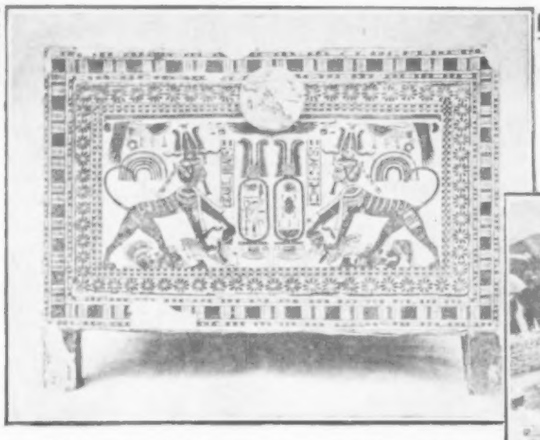
Lacquering — *an art that was never lost*



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American Electro-Platers' Society Convention

A Description of the Plating Industry of Providence, R. I., the Convention City, and Advance Information about the New England Convention

Written for The Metal Industry by WILLIAM H. MASON, Providence, R. I.

It is especially fitting that Providence should have been chosen by the American Electro-platers' Society as the 1923 convention city in which to hold its eleventh Annual Session, because of its close association with the manufacturing jewelry industry, which furnishes a very large proportion of the business or employment of the electro-platers, and because of the unusual diversity, size and scope of its industrial establishments. Just as Rhode Island is universally known as the "cradle of religious liberty," so Providence is recognized as the cradle of industrial supremacy and prosperity, for within its borders are located more than a dozen manufacturing plants that lead the world in their respective lines.

Photo by Hess
PROVIDENCE-BILTMORE HOTEL, CONVENTION HEADQUARTERS

When the several hundred electro-platers from sections of the United States and Canada visit Providence on July 2, 3, 4 and 5, they will be in the very centre of one of the most important sections where the electro-platers' art has flourished for more than three-quarters of a century. For, at Providence and the adjacent Attleboros, are located more than 400 manufacturing jewelry concerns, besides numerous other lines in which electro-plating is a very essential factor.

But, when it is realized that electro-plating carries with it not only the plating of gold and silver, but also such widely separated operations as finishing door-knobs, table lamps, statuary, chandeliers, buttons, automobile trimmings, graphophone records, builders' hardware and metal trimmings of every description, the importance of the work done by the society to further more efficient methods can readily be understood. With the intelligent study of plating difficulties, and the saving resulting from exact methods, much has been accomplished for American and export business.

HISTORY OF PLATING IN PROVIDENCE

The early history of the electro-plating industry of Providence is so closely interwoven into that of the manufacturing jewelry industry that it is somewhat difficult to state just when and where it had its inception. In fact its infancy seems to have a somewhat analagous beginning with Topsy, and just naturally "growed."

It is known, however, that as far back as 1798 Nehemiah Dodge, to whom belongs the credit of actually founding the manufacturing jewelry industry in Providence, conceived the idea of introducing a cheaper class of work than at that time was produced, nothing but solid gold or silver articles being then made. Of exactly what this cheaper jewelry consisted there is no record, but it is highly probable that it was a system of washing or gilding which preceded the modern electro-plating methods. Some time about 1805, it is alleged, parties from Attleboro obtained from Dodge his secret and immediately put it into practical use on a large scale, with the result that "Attleboro jewelry," so-called, began to appear in the market throughout the country in large quantities at greatly reduced prices.

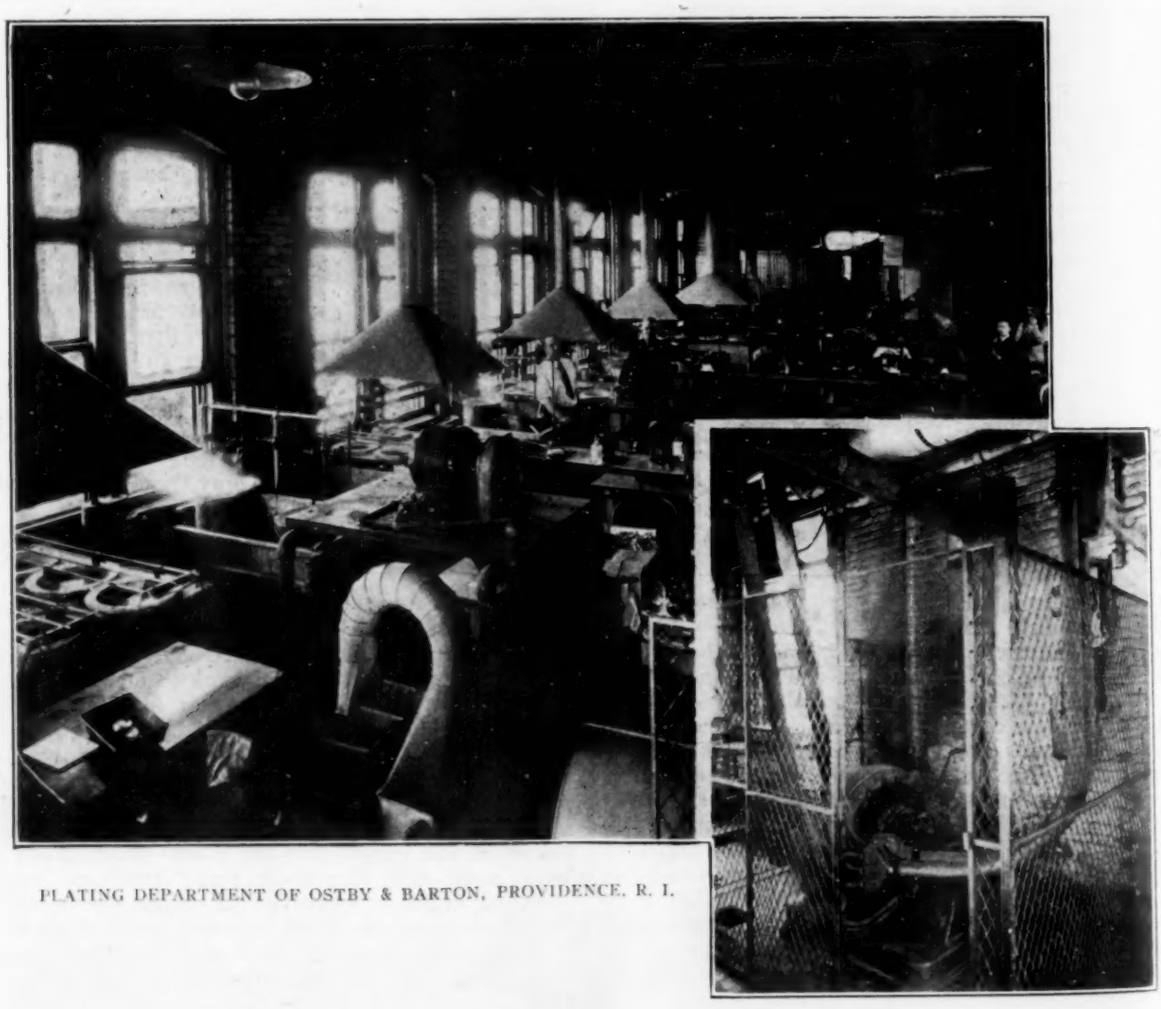
The jewelry industry grew and flourished and for many years such coloring or plating as was needed was

done by each manufacturing concern in its own plant. But, as smaller manufacturing concerns started in business, because of their limited space or finances, many were unable to equip electro-plating plants in their shops and so gradually outside or job shops, doing nothing but electro-plating, were established and have always done a thriving business dependent in a great measure upon conditions in the jewelry industry. One of the earliest concerns in Providence and one of the oldest in the United States, to devote itself exclusively to electro-plating was S. T. Lincoln & Company, which was established at 14 Page street in 1860. The firm had previously, from 1842, been engaged in the manufacturing jewelry business in Attleboro. In the small shop in Page street, many of the men who were among the pioneers of electro-plating in this city learned their trade.

It was not until immediately following the financial crisis which swept the country in 1873 that the number of concerns engaged in electro-plating became very numerous, and these were conducted by men who had learned the business in the larger shops. Among the earliest of these was Herbert E. Brown, who began business in 1870 and retired a few years ago but is still living in this city. Right here it might be well to say that Providence is primarily and logically a field for the job plater. At present time there are about a score of concerns in this district that conduct their own plants, several of which are fully equipped with the latest modern apparatus for doing up-to-date work and in consequence these shops are highly developed. One of these employs upwards of forty hands but the others are smaller and in all furnish employment to about 100 persons. No attempt has been made to enumerate these concerns here, or to illustrate their plants, but mention should certainly be made of a few of the electro-plating departments of such concerns as the Gorham Manufacturing Company, the Ostby & Barton Company in Providence and Whiting & Davis at Plainville.

The plating department of the Ostby & Barton Company, the largest manufacturers of finger rings in the United States besides manufacturing general lines of jewelry, is one of the largest and most up-to-date in every respect of any in New England, if not in the country, as may be seen from the illustration. The generator used was specially built for this concern and has a capacity of 12 volts and 1,800 amperes. Each plating tank has its own rheostat to regulate the voltage so as to get the best possible results from each tank for the particular class of work to be treated.

The department has, as part of its main equipment, eight coloring tanks with three jars of four gallon capacity in each; two coloring tanks with three jars of ten gallon capacity each; one silver plating tank of sixty gallon capacity; one nickel plating tank of sixty gallon capacity; one electric cleaning tank of forty gallon capacity; one stripping tank of forty-eight gallon capacity; one large dip sink; a lacquer room fully equipped for dipping and spraying; a large scratch brush lathe with twelve heads; two sand blasts; chemical closets, dryers, sawdust boxes, as well as numerous other small conveniences



PLATING DEPARTMENT OF OSTBY & BARTON, PROVIDENCE, R. I.

necessary to finish and handle the work properly.

All work, with very few exceptions, passes through the plating department at least once. The department is laid out to handle the factory's own particular product to the best possible advantage or, as the foreman of the department expresses it: "Quantity production with quality finish." All solution tanks are covered so that the workmen are not troubled with the steam arising in their faces. All gases, fumes, steams, etc., are taken away by a hood over each tank, these hoods being connected directly with a large suction blower. In handling the work each plater has his own solutions with a sink between each two tanks with running hot and cold water rinses, washing solutions, etc., making a very convenient arrangement. Tables are arranged opposite all the tanks with facilities for stringing up work, sorting and counting. Electric dryers, sawdust boxes, etc., are located conveniently to the tanks and tables. Located on the top floor of the Richmond street plant, the plating department has exceptionally good light.

AMERICAN ELECTRO-PLATERS' SOCIETY

The national electro-platers' organization was formed through the efforts of Charles H. Proctor of New York, so that the accumulated experience and knowledge of all the workers in the industry might be recorded for the benefit of each individual. The American Electro-platers' Society has but one aim and purpose, but one reason for its existence—the advancement of knowledge in the science of electro-plating and finishing of metal. Although a comparatively new organization, the society's activities have already resulted in important advances.

PROVIDENCE-ATTLEBORO BRANCH

Organized in March, 1915, the Providence-Attleboro Branch now numbers sixty members. Meetings are held twice a month in the Society's headquarters, 26 Custom House street, Providence. The rooms are equipped with apparatus for analyzing solutions and the members devote much of their spare time experimenting to produce more economical and efficient methods of finishing metal products. The branch carries out a comprehensive educational plan, with lectures by leading authorities and discussions of practical working problems, and it is their aim to secure the hearty co-operation of the manufacturers. The membership already includes many of the leading men in the business, but it is hoped to increase the numbers to include all of the electro-platers in this vicinity, of whom there are about 200.

Members of the Providence-Attleboro Branch began having visions of being hosts to the American Electro-platers' Society nearly two years ago and since that time the picture has been growing brighter and brighter. Confident that Providence will leave nothing to be desired from the social point of view, the officers and committees of the local branch have been devoting their energies in the direction of making the convention a superlative one from the educational and practical standpoint. And, with this aim in view, the programme was planned and its details are being consummated, so that every person honoring the convention with his presence will take back home recollections of the event that will prove valuable to him in his vocation as well as pleasing to the mind. But the social side has by no means been overlooked or neglected and there will be entertainment in plenty, and of such character as only "Little Rhody" can provide.

The Providence-Attleboro Branch held its regular meeting at Attleboro on May 17, at which time it was decided to continue the officers of the past year until after the coming convention and plans for the convention were discussed at considerable length. The officers of the branch are as follows: President—Levi J. Perkins; Vice-President—Robert Crook; Secretary and Treasurer—Cadlton J. Poynton; Assistant Secretary and Treasurer—James Simpson; Librarian—Louis Martin; Chairman of Board of Education—John McDonough; Sergeant-at-Arms—James Potter; Board of Managers—Gavin J. Tyndal, Harry Sholes and John Andrews.

FACILITIES FOR THE CONVENTION

All the sessions of the convention will be held in the new Providence-Biltmore Hotel, the opening of which, more than any one factor, is putting Providence on the map as a commercial centre and an ideal convention city. This magnificent 19-story, 600-room building, was formally opened with a municipal dinner and ball, June 6, 1922, in which 1,200 guests participated. It is considered the very last word in modern hotel construction, equipment and furnishings, without a peer in New England, and costs with the land on which it is located, $5,000,000. It is located in the civic centre of the city, facing one of the most spacious and picturesque malls in the United States and directly across the street from the Union Station, at which all delegates from out-of-town will arrive. Even those coming by either the New York or Norfolk steamers will be transported to the Union Station by trolley, and thence to the hotel.

Within a radius of four blocks are several first-class hotels—Narragansett, Crown, Dreyfus, Berkshire, and a number of smaller ones, all with good accommodations. The local committee of the Providence-Attleboro Branch requests that each delegate report to the registration booth at the Biltmore Hotel just as soon as he arrives in the city in order that he may be assigned without loss of time to the reservations. In addition to this the registrants will be given all the necessary tickets, badges and appurtenances, including the general programme of the business and entertainment features of the convention, together with guide books and information concerning the city, its advantages and attractions.

CONVENTION SCHEDULE

The schedule of business is a pretentious one and so that there may be no encroachment of any feature upon another, those in charge plan to have all the business sessions start on time so as to conclude the business designated for each, promptly, not losing sight of the fact, however, that the national association is a business body and that the convention first, last and all the time a serious proposition and not a social junket.

The local convention committee has arranged a tentative programme for the four days' stay of the delegates in Providence and, while full consideration has been given to the practical and technical side of the gathering, there are also a sufficient number of social features to escape the penalty of the old adage that "all work and no play makes Jack a dull boy." As outlined by the committee the programme is very elaborate and diversified, with something doing every minute. Nothing is being overlooked or neglected that will in any measure lend to the convenience or add to the pleasure of the visitors and when the details have been fully worked out it is expected that the schedule of meetings, trips, factory visits and social affairs will be one of the most elaborate ever offered the electro-platers at any previous convention. Invitations have been extended to a number of speakers of national reputation in connection with electro-plating, to present technical papers, or lead discussions, but as yet no positive announcement can be made as to who these speakers will be or the subjects upon which they will speak. In its present form, however, the convention programme is as follows:

MONDAY, JULY 2

Registration—The delegates will immediately upon arrival at the Providence-Biltmore Hotel proceed to the convention headquarters at the ballroom foyer and register and badges, cards and other means of identification will be distributed and assistance afforded in finding individual reservations. Here also will be found a general information bureau with numerous circulars descriptive of points of interest and means of reaching them, furnished through the courtesy of the Providence Chamber of Commerce.

1:30 p.m.—The initial session of the convention will be held in the ballroom of the hotel and will be called to order by the President of the Providence-Attleboro Branch, A. E. S., who will introduce Supreme President Walter J. Allen, of Grand Rapids, Mich., who will preside. Addresses of welcome will be given by Governor William S. Flynn, on behalf of the State of Rhode Island; Mayor Joseph H. Gainer, for the city of Providence.

The remainder of the afternoon, as well as the evening session, will be devoted to the presentation of technical papers on subjects pertinent to the plating industry, introduced by delegates from the different branches, and a general discussion of them.

TUESDAY, JULY 3

Day of Recreation: 9:20 a.m.—Steamer chartered for the occasion will leave for a thirty-mile sail down the picturesque Narragansett Bay to Newport, where the day will be spent. The stay at the City-by-the-Sea will be made as interesting as possible during the time at the disposal of the committee. It will include the famous ten-mile drive in pleasure cars, with a rendezvous at the Casino at Newport Beach, where an old-fashioned Rhode Island clambake will be served and every facility given for surf bathing in old ocean. The proverbial baseball game between nines representing the East and the West that have been such an interesting and exciting event of the annual field days of the convention in years past will, on this occasion be eliminated and in its place a distinctive Rhode Island feature will be introduced. This will be a series of water sports and games on the beach between contestants representing the two sections, for which a number of attractive and appropriate prizes will be offered.

At 5 o'clock the steamer will leave Newport for the return sail up the bay, arriving at Providence in time for supper at the hotel. In the evening the business sessions will be resumed, the consideration of technical papers being the order.

WEDNESDAY, JULY 4

9:30 a.m.—Business session, with speakers of prominence on industrial and technical topics, with discussions on practical problems. For the evening, arrangements are being made to witness the competitive exhibition of fireworks on the Kinsley Avenue flats, that will be the concluding feature of the Municipal observance of Independence Day. This display, which will last for more than two hours and be a competition between two large Italian manufacturers of fireworks for a special bonus prize of $300, is expected to be unusually fine and well worth witnessing.

THURSDAY, JULY 5

Morning—Groups will be arranged for the purpose of visiting the various electro-plating plants in this city and the Attleboros and places of interest. While this portion of the programme will necessarily have to be subject to a last minute arrangement, among the plants that are expected will be open for inspection will be the Gorham Manufacturing Company, the Ostby & Barton Company, the Brown & Sharpe Manufacturing Company, Nicholson File Company in this city and Whiting & Davis at Plainville. Among the places of educational and historical interest that will be included in the itinerary of sightseeing trips will be the State Capitol, City Hall, Roger Williams Park, Brown University, Providence College, Rhode Island School of Design.

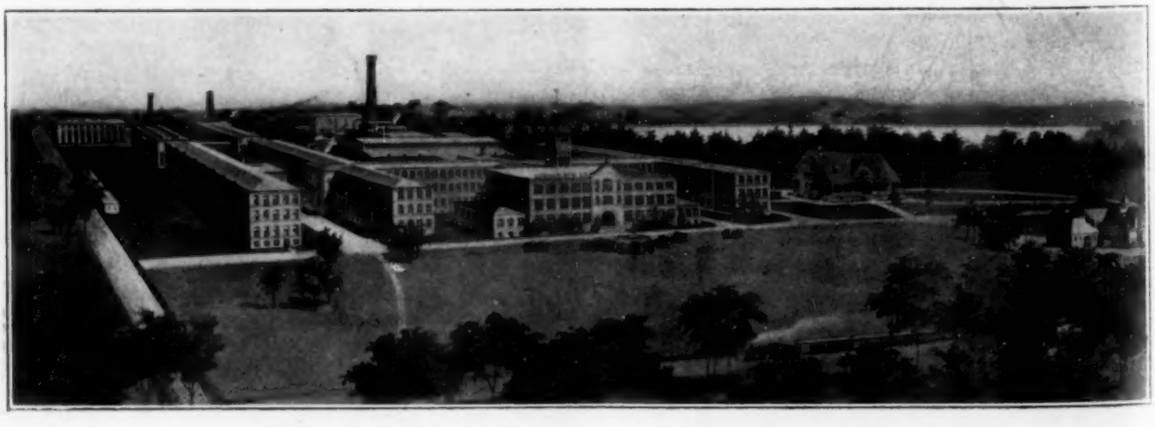
2 p.m.—Business session: Final reports of committees; election of officers; selection of place for meeting of 1924 and other business.

6:30 p.m.—Annual Conevntion Banquet in ballroom of Biltmore Hotel; installation of national officers with formal ceremonies. This will be followed by an entertainment of high order of merit and will conclude with dancing.

In addition to the regular convention programme, direct attention will be given to the arrangement of special features for the entertainment of the ladies who will accompany the delegates, the plan being to provide something different for each day. These will include specially directed shopping tours through the numerous large department stores, some of which will stage fashion shows for the especial benefit of the feminine contingent of the convention. There will be trolley and automobile trips, luncheons and numerous other diversions for the enjoyment of the ladies while the delegates are giving their attention to the serious transaction of business or technical discussions.

Below are the names of some of those who have already signified their intention of exhibiting materials at the convention:

Z. Berberian, Providence, R. I.
The Egyptian Lacquer Mfg. Co., New York City.
The Seymour Manufacturing Company, Seymour, Conn.



PLANT OF THE GORHAM MANUFACTURING COMPANY, PROVIDENCE, R. I.

The Hanson & Van Winkle Company, Newark, N. J.
Baker & Company, Inc., Newark, N. J.
J. B. Ford & Company, Wyandotte, Mich.
E. J. Woodison Company, Boston, Mass.
Geo. L. Claflin Company, Providence, R. I.
Celluloid Zapon Company, New York City.

G. J. Tyndall of the Convention Committee states that they expect to have twice as many, if not more, exhibitors when the convention opens, according to indications from advance information.

WHITING & DAVIS COMPANY, PLAINFIELD, R. I.

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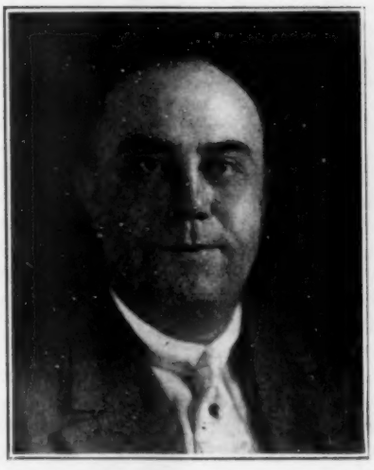
WALTER J. ALLEN,
President

B. D. AUFDERHEIDE,
First Vice-President

CHARLES H. PROCTOR
Founder

JOHN E. GARRICK,
Second Vice-President



FRANK J. HANLON,
Secretary-Treasurer

FRANK C. MESLE,
Editor of the Monthly Review

Early Days in the Electro Plating Industry

Reminiscences of a Plater Who Has Been with the Industry Since the Early Days in the United States

Written for The Metal Industry by C. H. BUCHANAN, of The Ely Anode & Supply Company, Hinsdale, Mass.

Dr. Adams of Boston, Mass., was the first to introduce nickel-plating in 1866 with the nickel-sulphate solution. He deserves a great deal of credit for his efforts in experimenting and obtaining a nickel salt and solution that would give a good deposit on the metals in competition with silver plating. Nickel has since taken the place of silver on a good many classes of work. Dr. Adams had the double sulphate of nickel solution patented. Some writers on the subject claim that Böttger was the first to be successful in obtaining a deposit of nickel. I have noticed in books on electro-plating that Böttger experimented on cobalt solutions. Roseleur had a solution of nickel ammonium sulphate and ammonium carbonate, but he did not think much of nickel as a deposit for metals. He certainly knew how to make gold solutions, and I think that most of the gold platers are still using some of his solutions.

PERSONAL EXPERIENCE

My first experience in nickel plating was in 1870. My father, James C. Buchanan, had started a small plating plant in Brooklyn, New York, through a nephew of his who had been an assistant plater with the Beardslee Nickel Plating Company located on lower Fulton street near Fulton Ferry, Brooklyn. At that time they used to call the assistant platers "scrubbers," on account of cleaning the work before plating. The work was thoroughly rinsed in a large water bath after each dip. The platers in the early days believed in having large water tanks on account of having to plate very large work as well as small articles.

When my father was experimenting on nickel solutions he was fortunate in having a friend, a chemist and metallurgist, who lived in the same house that we occupied. My father gained a good deal from the chemist by learning the reactions of the metallic salts and acids. In experimenting with nickel solutions, he found that he obtained the best results by using the double chloride of nickel solution, not conflicting with Dr. Adams who had the double sulphate solution. He made all of his own nickel salts, using Wharton's coarse grain nickel for anodes. The anodes were made with carbon plates which were placed in grooved wooden black walnut frames and sewed with heavy unbleached muslin instead of canvas. The coarse grain nickel was packed in solid next to the carbon plates. The fine nickel was used in making nickel salts. At that time there was not much of a demand for nickel, and it cost $4 per pound. For current, Bunsen cells were used. In the early days of nickel-plating, we could not purchase any cast anodes as there was no chemical or supply house which cast nickel. Anodes, rouge and crocus were purchased from George Zucker, long before tripoli composition came into use. We had to cut our own muslin buffs and used Canton flannel for coloring and nickel buffing. There was a good deal of sand buffing done with walrus wheels, pumice stone and oil, on certain kinds of brass work. We used the walrus hide for very small wheels covered with emery and the wooden wheels faced with leather, bull neck or sheepskin for emery polishing. We cut wheels out of Spanish felt as thick as we could purchase it, placing the sections together to nickel-buff work, such as cast register grates and stove trimmings. The small pieces were for buffing small work, such as watches, deep reflectors and any class of work that could not be buffed with muslin buffs.

EARLY PLATING SHOPS

It was soon after the time that my father found he could produce good plating with the double chloride solution that he established a nickel-plating plant on Ann street, New York. There were only four other nickel-plating plants at that time. The United Nickel Plating Company, the plant that Dr. Adams (the patentee of the double sulphate nickel solution) was interested in, was one. The American Nickel Plating Company was another. This was the company that L. L. Smith had charge of. He was the inventor of the Little Joker dynamo, manufactured by Wallace & Sons. This was some years later, I think about 1874 or 1875, and Dr. Weston invented the Little Wonder dynamo about the same time. Dr. Weston had been interested in a nickel-plating plant on Centre street, New York, before he invented his dynamo. The Hanson & Van Winkle Company took over Dr. Weston's dynamo, and the company was then named the Hanson, Van Winkle & Weston Company. Mr. Brush, I have heard, was connected with a plating plant in Cleveland, Ohio. He invented the Brush dynamo for electro-plating. When he was experimenting he found that by connecting two pieces of carbon he obtained a good electric light, and it was through this experiment that he introduced the carbon light (the arc lamp) which was patented by Mr. Brush. The Hochansen Company manufactured dynamos and sold a number of them to electrotypers as well as platers.

The third nickel-plating plant that was established when my father started his shop was the Beardslee Nickel Plating Company in Brooklyn, the plant I had reference to where my father's nephew had been employed as an assistant plater. I have heard that, in addition, Dr. Adams had a small plant in Boston where he had been experimenting with his nickel solution.

VARIETY OF WORK PLATED

When my father established his plating plant in New York he had to employ the old silver buffers for buffing. At that time some of the first work that he nickel-plated was the Smith & Wesson and Colt revolvers, and saddlery hardware, such as the steel Daniels horse-bits which were imported from England. Later he did the famous patent lever club skates that were manufactured by Peck & Snyder, an old sporting goods house on Nassau street, which was taken over in later years by A. G. Spalding Brothers.

In the early days of nickel-plating it was no trouble to obtain work. The concerns that had silver-plating done found out that nickel-plating was practical and could be applied to the metals in place of silver; it could be plated for a lower price than silver, so they commenced to send their work to the nickel-platers. We received considerable job work from people who wanted to see what kind of a deposit nickel made, as it was a new industry.

In 1871 and 1872 there was a great demand for nickel-plating, especially on stove trimmings, open fire sets and register grates. At that time the people heated their houses with hot air furnaces, stoves and open fireplaces. We employed for polishers Germans who had come to this country, most of them from Solinger, where they worked on emery wheels, polishing cutlery and shear work. The Germans were good polishers, but they knew very little about buffing.

The banner year for the nickel-platers was in 1876, the year of the Philadelphia Centennial. Almost all the manufacturers that had nickel-plating done, wanted to be represented at the Philadelphia Exposition, and in the early part of the year we worked night and day on account of having to do this extra work. I might mention the class of work we were plating at that time. In the brass goods line we nickel-plated chandeliers which were sent to us buffed fine, wrapped up in tissue paper and an outside wrapper to keep the arms and trimmings from being scratched. The finish on the chandeliers was nickel and gold. The arms, tubing and some of the large shells were nickeled. The keys in the gas cocks and some of the small shells were gold-plated for contrast.

GOOD PRICES OBTAINED

The nickel-platers of today will be surprised to know the prices we received in the early days, but they must consider there was very little competition in that line, and we received the work only in small quantities. My father plated the first club skates with the patent lever for Peck & Snyder. The price was $1.50 per pair, but he received only 25 to 50 cents per pair. Also, as I stated before, grain nickel was $4 per pound, and we had to use the Bunsen cells for batteries and run the work some time in the plating bath. The cost of material and the time in plating was considerably more than when they commenced to use the plating dynamos and cast nickel anodes.

When the concerns that had silver-plating done found out that nickel gave a good deposit and could be used on a number of articles in place of silver at a much lower cost, they commenced to send in their work. Brass dog collars were sent to be plated in straight lengths and had to be bent round after being plated. The old-time platers had to turn out good plating so that it would not crack or peel on brass work even if the manufacturers had to round it up after nickel-plating the articles. We plated a number of brass buckles for ladies' belts, which were in style at that time and brass lamps such as the old German student lamp and many other makes of lamps. Iron and steel work that was plated for the Exposition consisted of safe trimmings such as bolts and locks which were inside of the safes, stove trimmings, register grates, open fireplace parts, piano pedals, hardware and many other articles too numerous to mention. The nickel-platers received a good price for this work as the manufacturers wanted the very best work that could be done by the reliable plating shops and did not question the price.

EARLY DAYS OF ANODE CASTING*

Mr. Yates and Mr. Ely, after working some nickel mines, formed a partnership in 1877 under the firm name of Yates & Ely. I knew of no one making nickel anodes at that time but Joseph Wharton at his Camden works. Several others started at that time to make anodes, but as they would drop to pieces they had been sewed up in canvas covers. Yates and Ely did not do this, but said if their anodes crumbled or broke they would replace them. The great trouble in making anodes at that time was that parties did not use the correct furnaces to produce the temperature of over 2,800 degrees F. required to melt the nickel. Not only did they have to instruct the platers, but also give them an anode. They still make and cast from the small crucibles, although there is a great saving in using nickel furnaces. Personally I have tried the other furnaces, and although I can save expense, I do not get as good results.

Some of the platers of today may smile when they read the ancient history of the nickel and carbon anode, but my experience has been that in working this old style anode with the double chloride of nickel solution, even with the Bunsen cells, the Wharton's grain nickel corroded or dissolved readily due to having a chloride solution instead of a sulphate. I found there was a great difference in the kind of nickel used in the anode. I purchased some of the cube nickel, and it was some time before it commenced to corrode even when I was using the dynamo for current. They called the metal "English Nickel." I tried out the French grain nickel but noticed that Wharton's nickel proved to be much better than the foreign or imported nickel to use for anodes. We discarded the carbon plates when we thought the anodes were not working well, replaced them with new carbons and sold the old ones to an electrical supply house which used them for batteries.

EARLY LAWSUITS

Mr. Ely states that the question of Dr. Adams' patent is interesting. The patent on both anodes and solution were upheld by Judge Blatchford although Böttger in Germany had given the formula and plated according to it, both with the double nickel sulphate salts and anodes.

I think it was in 1872 when my father was sued by Dr. Adams of the United Nickel Company for infringing on his patent double sulphate of nickel solution. The case came up before Judge Johnson, and the decision rendered was that the solution my father was using (the double chloride of nickel) and grain nickel for an anode did not infringe on Dr. Adams' patent. I was sorry that my father did not apply for a patent, but his attorney did not care to bother with it and my father was very busy at the time.

A few years later when there were several more nickel-platers established, they were sued by the United Nickel Company (Dr. Adams' company). The platers combined and raised enough money to employ Roscoe Conkling as their attorney to defend the suit. Judge Blatchford upheld the patent and claimed that as Dr. Adams was the first one to do nickel-plating successfully it did not make any difference what solution was used, and that it was an infringement on the patent.

The United Nickel Company then charged a royalty to the nickel-platers, I think, on 100 gallons of solution. It was 3 cents a gallon per month, and for larger quantities less than 3 cents per gallon.

I think that the Hanson & Van Winkle Company cast nickel anodes about the same time that Mr. Ely did. I know my father had tried out two or three nickel anodes that were case by Joseph Wharton in the early days, but found that they crumbled and used them up by sewing heavy unbleached muslin around the anodes.

These reminiscences will be completed in a later issue.—Ed.

*Much of the information on this subject was supplied by C. Upham Ely.

Threading and Machining Monel Metal Castings

Q.—We have had considerable trouble in machining monel metal castings. We cannot cut threads up to a shoulder, using a solid also self-opening die head.

A.—Monel metal like most metals, possesses individual machining qualities. On account of the toughness of the metal tools should be made from a first class grade of high speed tool steel and ground with sharp cutting angles.

In using dies and taps for cutting threads they should be ground with a long lead so as to allow full depth of thread to be cut gradually and prevent strain on the teeth. Use a roughing and finishing die when threading to a shoulder. Drills and box tool blades should be made from high speed steel and ground with as much relief as posible.—P. W. BLAIR.

Survey of Nickel Solutions

To Bring Out in an Orderly Fashion, Much of the Data on Nickel Solutions Scattered Throughout Various Sources That Will Be of Value to the Electro Plater and to Refute Some Statements Are the Purposes of This Article—Part 4*

Written for The Metal Industry by JOSEPH HAAS, JR. Plating Superintendent

PRINCIPLES UNDERLYING THE ACIDITY OF NICKEL-PLATING SOLUTIONS†

The principal cations (ions which are discharged at the cathode and are present in a simple nickel-plating solution) are nickel ions and hydrogen ions. The nickel ions are derived from dissociation of the nickel salt, usually represented as follows:

$$NiSO_4 = Ni^{++} + SO_4^{=}$$

The hydrogen ions may be formed by the dissociation of any acid that is present, e.g., sulphuric or boric acid, which dissociate as follows:

$H_2SO_4 = 2H^+ + SO_4^=$ or $H_3BO_3 = H^+ + H_2BO_3$

Other conditions being equal, the proportion of nickel and hydrogen that will be deposited by the current from a given nickel solution will depend upon the relative concentrations of the nickel and hydrogen ions. The metal cathode efficiency decreases as the acidity (or hydrogen ion concentration) increases.

The strength of an acid is measured by the extent to which, when dissolved in water, its solution contains a large number of hydrogen ions. A solution of a weak acid such as acetic acid (present in vinegar) contains less hydrogen ions; while even a saturated solution of a very weak acid such as boric acid contains a very small number of hydrogen ions. In considering the acidity of a solution it is necessary, therefore, to distinguish between (a) the quantity of acid present, and (b) the degree of acidity; just as we must distinguish between the quantity of heat contained in an object, and degree of heat, i.e., the temperature of the object. In electrodeposition the concentration of acid present in a solution is usually of much less importance than the degree of acidity or the "hydrogen ion concentration."

There are various methods of expressing numerically the hydrogen ion concentration of any solution, all of which are in terms of a "normal solution," that is, one which contains one "equivalent weight" (approximately one gram) of hydrogen ions per liter of solution. In such a solution we could call the hydrogen ion centration N; in a solution with one-tenth that concentration it would be 1/10 N, N/10 or 0.1 N, etc. In most nickel solutions we have only a small concentration of hydrogen ions, e.g., 1/10,000 N or N/10,000 or 0.0001 N. In order to avoid the use of a large number of figures, such values are frequently expressed in terms of logarithms, i.e., of the powers of 10. Thus 100 is 10^2; 1000 is 10^3, i.e., the logarithm of 100 is 2; of 1000 is 3, etc. In expressing fractions, the logarithm is designated as negative; thus 1/100 is $1/10^2$ or 10^{-2}; 1/1000 is $1/10^3$ or 10^{-3}, etc. In order to still further simplify the expression of hydrogen ion concentration, Sorensen proposed the use of the number or "exponent," without the negative sign; and designated this number as the "pH" of the solution. Thus if the hydrogen ion concentration is one hundredth normal, i.e., 1/100 N or $1/10^2$ N, or 10^{-2} N, the pH is 2. The relation between these different forms of expression is shown in the following comparison:

TABLE 1. METHODS OF EXPRESSING HYDROGEN ION CONCENTRATION

Fraction	Decimal	Logarithm	pH
1/10	0.1	10^{-1}	1
1/100	0.01	10^{-2}	2
1/1000	0.001	10^{-3}	3
.....	.....	...	..
1/1,000,000	0.000,001	10^{-6}	6
1/10,000,000	0.000,0001	10^{-7}	7

It is important to note that in the pH system the numbers increase as the hydrogen ion concentration decreases; thus a solution with pH of 4 is more acid than one of 6. This may at first lead to some confusion, but is no more difficult to master than the use of gauge numbers for sheet metal and wire, etc., in which a larger number indicates a smaller diameter of thickness.

Pure water contains a very small but equal number of both hydrogen ions and hydroxyl ions, formed by dissociation, thus

$$H_2O = H^+ + OH^-$$

Hydroxyl ions may also be derived from bases such as sodium hydroxide, thus

$$NaOH = Na^+ + OH^-$$

The concentration of hydroxyl ions is a measure of the alkalinity of the solution. In all water solutions, the product of the concentration of hydrogen ions and hydroxyl ions is (at 25° C or 77° F) about 10^{-14}. In pure water each is equal to about 10^{-7}; therefore the pH of pure water or of a strictly neutral solution is 7.

Most accurate measurements of pH are made with a hydrogen electrode, which requires complicated apparatus, and moreover may not be applicable to nickel solutions. A much simpler method depends upon the use of appropriate indicators. An indicator is a dye, the color of which changes with the pH. The common use of indicators in titrating acids or bases depends upon the fact that their color is different in acid and alkaline solution and with a properly selected indicator if a neutral (or some specified) tint is obtained, the acid has been exactly neutralized by the base. The amount or concentration of the acid can then be calculated.

TABLE 2. COLORS OF INDICATORS

	Acid	Neutral	Alkaline
Methyl orange	pink	orange	yellow
Litmus	pink	purple	blue
Phenolphthalein	colorless	colorless	pink

Although these indicators are generally used to determine the amount of acid present, they may also be employed for measuring the pH or degree of acidity. Thus, if equal amounts of methyl orange are added to the four following solutions, the colors will be as stated.

TABLE 6. RELATIVE pH OF ACIDS

Acid	Concentration	Color with Methyl Orange	Approximate pH
Sulphuric	0.01 N	pink	2
Acetic	0.01 N	orange pink	3
Boric (saturated)	0.75 N	orange	4
Carbonic (saturated)	0.06 N	yellow	6

These colors indicate that in equivalent strength, acetic acid is much weaker, i.e., produces less hydrogen ions than does sulphuric acid; and that even more concen-

*Parts 1, 2 and 3 appeared in our issues for September, 1921, November, 1922, and February, 1923.

†Abstract of address delivered to American Electro-Platers' Society, Indianapolis, July 2, 1921, by W. Blum and M. R. Thompson.

trated solutions of boric acid or carbonic acid have a much smaller acidity.

The terms "acid," "alkaline" or "neutral" are relative only, and it is therefore necessary to specify in each case the indicator used. Thus, if to three tubes of a normal solution of sodium bicarbonate, $NaHCO_3$ (containing a slight excess of carbonic acid and have a pH of about 7), the above three indicators are added, the results will be as follows:

TABLE 4. REACTION OF $NaHCO_3$ SOLUTIONS

Indicator	Color	Common designation
Methyl orange	yellow	alkaline
Litmus	purple	neutral
Phenolphthalein	colorless	acid

Therefore, according to the indicator used, the same solution may be (as commonly expressed) acid, alkaline or neutral.

Each indicator is most sensitive in a particular range of pH, therefore it is necessary to employ for any given purpose a suitable indicator. In the effort to secure high sensitivity, a large number of indicators have been studied by various investigators, and the most favorable ones have been selected.

The use of litmus paper to determine acidity is objectionable, in that it gives no quantitative factor. The method described below gives such a factor, and if applied by electro-platers will add considerably in clearing away many difficulties experienced in the past.

Gillespie Method for Hydrogen Ion Determination in Nickel Solutions

APPARATUS REQUIRED

1. Two or three dozen glass "preparation tubes," thin wall, flat bottom, without flanges at top, 15 mm. (5/8") outside diameter and about 7.5 cm. (3") long. They should be marked with a file scratch at the 5.5 cc. level, ascertained by running in that volume of water into a dry tube, from the burette. As the bore of the tubes varies somewhat, pairs should be selected that have the scratch mark at about the same level. Each tube should be marked, on a gummed label at the top, with its drop and pH number.

2. Several test tube racks for the above.

3. Three dropping bottles, about 50 cc. capacity each and preferably of the medicine dropper type. These are to hold 0.4% Methyl Red indicator solution, 0.05–*N*–Sodium Hydroxide and 0.05–*N*–Hydrochloric Acid, respectively.

For the ordinary nickel plating solution range of about pH = 4 to 6, Methyl Red is suitable. This is made by dissolving 0.1 g. of the powdered dye in 7.4 cc. 0.05–*N*–Sodium Hydroxide solution, preferably by grinding with the solution in an agate mortar, then diluting up to 250 cc. with water.

4. 5 cc. Pipette.

6. Burette for measuring distilled water.

7. Comparison Block or "Comparator," with holes for nine tubes (see diagram). This should be neatly and accurately made, since if the holes are not true and well alined, the use of the block will be unsatisfactory. The block should be painted black, inside and out.

PREPARATION OF COLOR STANDARDS

The color standard tubes are prepared in pairs, having ten drops of indicator solution divided between each pair, in the ratios shown in the following diagram.

Numbers Represent Drops of Indicator Solution in Tubes.

Full Acid Row	9	8	6	4	2	1
Full Alkaline Row	1	2	4	6	8	9
pH number	4.0	— 4.4 —	4.8 —	5.2 —	5.6 —	6.0

After adding the indicator to each tube, run in several cc. of water from a burette, then add 1 drop of 0.05–*N*–Sodium Hydroxide solution to each front tube of the standard pairs, add more water from the burette until

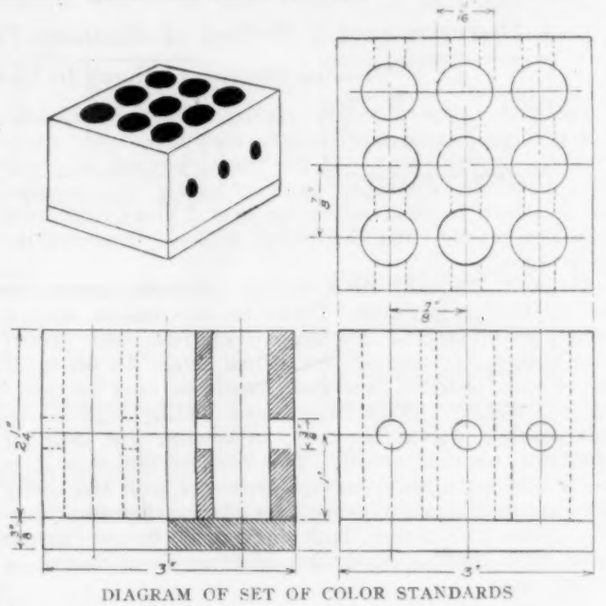


DIAGRAM OF SET OF COLOR STANDARDS

the volume is 5.5 cc., cork, shake and place in the rack. Each back tube of the standard pairs is made up in a similar manner, except that 1 drop of 0.05–*N*–Hydrochloric Acid is added, instead of the alkali.

These color standards are not very permanent and should be discarded and made up fresh every day or two. The stronger acid tubes decompose first, as shown by a brown deposit and a weakening of the red color.

DETERMINATION OF pH

When measuring the pH of an unknown solution, always filter it first, unless it is quite clear. Pipette 5 cc. into each of three clean tubes, add 10 drops of the indicator solution to one tube and make the other two tubes up to the 5.5 cc. mark with water from a burette. Shake the tubes and insert in the comparator block (see diagram) in the front row of left to right holes, with the tube containing indicator in the center and with two tubes filled with water in the holes behind it in the middle row, front to back. Select two pairs of consecutive color standards, judged to be near in color to the unknown solution and insert a pair in each of the side rows of holes, front to back, thus filling the block.

View the tubes through the holes in the front of the block, against a good light, such as the sky, or a piece of ground glass mounted in the window. Change the color standards until two pairs are found between which the unknown plus indicator will match. Thus if the color of the latter is judged to lie halfway between the 6/4 and 8/2 pairs, it should be recorded as pH–5.4. If between these pairs but nearer one than the other, it should be recorded as either 5.3 or 5.5, as the case might be. Occasionally, a solution will match exactly with one of the standard pairs.

When a number of solutions of about the same nickel content are being tested, it will sometimes be permissible to save time by letting the first two tubes of unknown plus water represent the entire series, merely changing the unknown plus indicator each time for a new sample.

When regulating the pH of solutions, it should be kept in mind that pH–4 is more acid than pH–6, conversely, pH–6 is more alkaline than pH–4. In other words, on the scale used, as the hydrogen ion concentration **decreases**, the pH number **increases**.

This series will be continued in a later issue.—Ed.

An Almost Fool-Proof Cleaning Process

A Description of a Method of Cleaning Pieces in Large Quantities Before Nickel Plating

Written for The Metal Industry by ELMER H. WOODMANSEE, Foreman Plater

Cleaning, preparatory to plating (especially nickel), has perhaps caused more worry than any other single problem, mainly because of the human element involved. Therefore, the following process, which was installed and has been in constant use for over 2 years, with such excellent results, that the writer believes it merits the above title.

While it was, of course, evolved primarily for use in our particular problems, I can see no reason why it cannot be applied to any large production, with proper modifications, to suit each individual shop. In my opinion at least, separate generators should be used for cleaning and plating. With large barrel plating department, still another should be used, otherwise, use cleaning generator for that work. The reasons are that it is possible to use a lower voltage generator with less costly resistance and waste of power, for plating than for cleaning. Also, in cleaning, both direct and reverse current being used, there is no danger of reversal of current in plating vats.

Understand this is only in large production problems. The inclosed sketch will make clear the method described. Eventually all operations will be performed automatically, with possible slight rearrangement of tanks to allow proper sequence of operations.

Cleaners are all made up with 2 ounces to the gallon of water, 4 lbs. added daily to the two electric cleaners, that is 4 lbs. each to cleaner of 350 gallon capacity, and 6 lbs. to the soaking tank of 700 gallon capacity, every day. (The name of cleaner used will be furnished on request.) Soaking tank is cleaned every three months. The first electric cleaner has been used five weeks, and the second electric cleaner, two months, but as a precaution, the first is made up fresh every three weeks and the second, every six weeks.

The total cost of cleaners used is $10.58 per week, economical after all, considering the fact that over 5,000 large pieces are cleaned daily, practically with actually less than .01% loss. Objections may be raised because of first cost of equipment, but when it is considered that no deterioration takes place (if tanks are well insulated to prevent grounds and subsequent electrolysis), and no rejections because of imperfect cleaning, comparisons of costs will prove this method more economical, with one tank only.

CLEANING OPERATIONS

Operations of cleaning are as follows: Our work is very highly polished electric iron tops (sheet steel), with handles spot welded in, and final finish secured, with tampico brush wheels, with lard oil and emery cake used as an abrasive medium, before plating, as well as cold rolled steel stands, that are bright plated. They are racked, four to rack, and hung in soaking tank for five to ten minutes, removed and hung direct into first electric cleaner with current as for plating, remain thirty seconds, rinsed in cold water, hung in 5% solution of hydrofluoric acid, with perhaps 2% of hydrochloric acid, removed, rinsed in cold water, boiled out in hot, hung in second electric cleaner with reverse current (that is negative to positive), rinsed in cold water, immersed in 20% solution of hydrofluoric acid, rinsed in cold water and hung direct in nickel tank. There they are plated forty-five minutes with twenty-six amperes per square foot. Stands are plated fifteen minutes or one revolution of tank. These operations are performed very rapidly and in sequence, each operation receiving the same length of time in each tank except the last two, which are immersions only. The time required to load fifty-five hooks, holding 220 pieces, is actually less than four minutes. The tanks, as the sketch will show, are very compactly arranged and as three men are used, very little retracing of steps is necessary.

Our electric cleaning tanks are insulated, by setting on 8" x 8" timbers soaked in asphaltum, with glass between timber and floor. One inch of metal is cut out of both inlet and return steam coils and 8" sections of steam hose inserted secured with sheet metal stiffening and four clamps, two on each side of gap in metal. It should be understood that hose has the two pipes inserted for a distance of 3½ inches inside, leaving, as before stated, one inch gap in the iron pipes. These pieces of steam hose will stand up to 30 lbs. pressure, for four to six months, when they are renewed. I am confident that any concern trying this method, with their own individual requirements carefully considered will obtain the same results I have.

Voltage used in electric cleaners is ten and all the amperes the metal will draw. I would not, however, recommend this voltage for brass and copper. Solutions are all used at boiling point. Two sketches are shown.

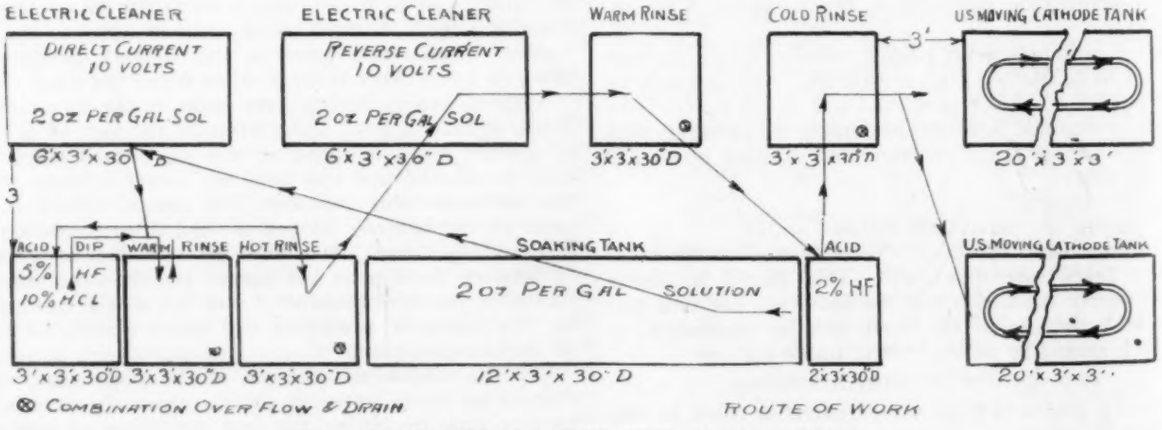


FIG. 1. PLATING ROOM LAYOUT USED BY THE AUTHOR

We use the No. 1 sketch. No. 2 suggested by Mr. K. T. Potthoff appears to be better than ours, but the correct and direct method is impossible to use in our plant, because of width of room does not allow us to place the soaking tank at the head of operations at place marked with cross, and crosswise of the room instead of lengthwise, with the other operations following in sequence.

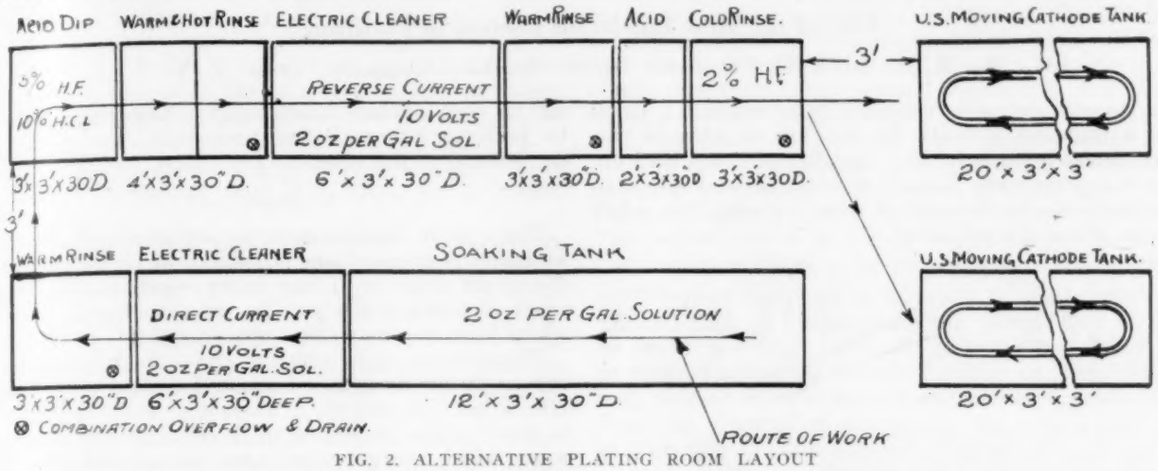


FIG. 2. ALTERNATIVE PLATING ROOM LAYOUT

Buffing

By C. L. BUCHANAN, Matchless Metal Polish Company, Ill.*

We must assume that the surface that we are working with has been properly polished, by that we mean all deep scratches are eliminated and we meet only innumerable fine scratches. These we will buff. To accomplish our end, the first consideration is the buff and for this case let us assume that the work is brass or copper. The buff best adapted is made from cloth of hard twisted threads and as is termed finer count, say 80/84 or 80/92 per square inch, made of whole discs, turned. The speed should be figured on the base of peripheral feet per minute and the best for this class of metal is 9,500 to 10,000 feet per minute.

Let me state here that many manufacturers do not give this the serious consideration due, preferring to save, as they force themselves to believe, by using pieced sewed buffs, which do not withstand the strain. They seriously impede their own progress and improvement.

With the proper buff, revolving at proper speed, we should now consider the buffing composition. This, to cut down as it is intended to do, should be made of high grade greases and pure powdered tripoli. High grade greases are hard greases, which necessarily are animal greases, the melting point of which is high. The object of the use of these is that they are easily saponified and will not encrust on the work, but should they do so on fine chased work or imbed against a shoulder or angle of the work, they will readily saponify in the potash or cleaning solution. Such greases readily adhere to the periphery of the buff and become the bond that holds the abrasive—Tripoli—which in turn does the cutting.

Remember, please, that the tripoli must be sufficiently fine, and the stone from which it is crushed, of a degree of hardness that will permit the completion of crushing or abrasion to the end that the first cut is truly coarser than the succeeding ones, thus giving the base for what we term color. Always remember that the intent in buffing is, that the composition on the buff does the cutting and should protect the buff from undue wear, the buff only acting as the conveyor for the composition to apply to the work surface to cut.

Having cut down the surface, we turn our attention to coloring or increasing its lustre by the use of a composition made of the same quality of greases. But the abrasive now is a fine silica.

On the fineness of this, opinions differ, with the result of a surface (when viewed under the glass) of more or less fine scratches, finer than the tripoli left on the work. The finer these can be made and the more numerous they are—the smoother the surface appears to the eye. The coloring should be done with a slower moving buff than when cutting down. When plated nickel, the work is returned to the buff for nickel coloring. Now mark please the expression "nickel coloring." There are many who differ from us in that they state that it should be **cut down** then colored.

I hold that nickel deposited with the right current—amperes and volts—in a solution chemically balanced and of sufficient metallic content, is colored only (or if you will so consider it—burnished) in one operation with a composition of the same quality greases explained. But the abrasive is very soft—being lime, generally known as Vienna lime. Its action tends to give to the nickel a deep (under surface, seemingly) blue known only to this metal. This color is obtained through combined action of the lime and friction. Should the deposit be slightly harder than we have suggested, or the surface be large, requiring the use of wider face buffs and more friction applied by the operator, a greater quantity of lubricant—soft greases—is needed in the composition. But the conditions being ideal, one operation should suffice and the work presents a brilliant clean surface.

There was a thought once used that oxide of iron—crocus or rouge—was the proper abrasive for both coloring before nickeling and in nickel coloring, but later knowledge proved this is not so good because it left after it a film of the oxide that exhibited a much different color on the nickel. In the manufacture of compositions the makers are forced by users to incorporate other abrasives and softer greases to satisfy demand in price, but in my humble opinion, the user is deceiving himself and is unnecessarily increasing his buffing cost, although honestly believing that he is holding down his cost.

*A paper read before the Job Platers' Association of Chicago, January 9, 1923.

Glue in Polishing Work

One of the Most Important Factors in Polishing*

By B. H. DIVINE, President, Divine Brothers Company, Utica, N. Y.

Our experiences and researches have reached a point where a standard formula for the use of glue is not only recognized, but possible to install, and it has been installed in a great many places with remarkable results. It was remarkable not because of what we know but what the other fellow did not know.

THE GLUE ROOM

The first thing to consider is the glue room. This should be well lighted, the doors should be double swing doors which will automatically close, the room should be well ventilated; no outside windows should be allowed to be open either in summer or winter. This is because glue lifted from a glue pot on a brush, is instantly chilled if subjected to the slightest draught and its efficiency is highly impaired within a few seconds.

Absolute cleanliness should prevail in a glue room and in relation to every part of the glue apparatus, for glue is nothing more or less than the combination of dead meat and water, and a chemical examination of glue shows it to be a mass of moving bacteria, and old glue, even old over night, when mixed with new glue in slight proportions, reduces the efficiency of the new glue as much as fiftey per cent., and that occurs even before you start to use glue.

WHEEL DRYING

The wheel drying room should be adjacent to the glue room. It should be equipped with ventilators at the floor and transoms or ventilators at the top of partitions. The temperature can be any normal temperature prevailing in a plant either in summer or winter.

No wheel should be used within forty-eight hours after the glue and abrasive are applied to it, for it requires at least forty-eight hours for the glue to set, which means thoroughly hardened. The practice of gluing up wheels at four or five in the afternoon for use the next morning is a very expensive practice, and it is a well-known fact that the heading on such wheels does not last as long as those which are glued up on Saturday and laid aside and put into work on Monday morning. In literally hundreds of factories where I have asked the question—"why did you use these the next morning?"—the say— "We must have them because we have not enough wheels."

THE PROPER GLUE

The next step is the selection of the proper glue, taking into consideration not only the glue itself, but the work it is to perform. Some kinds of heavy grinding work, using coarse abrasives and high speeds, require a glue of a different character than some other work perhaps, with finer numbers of emery and slower speeds.

It is possible also to perform practically all the operations encompassed in flexible grinding and in polishing by using as a base a glue with the proper jelly strength, viscosity and flexibility required for the coarser numbers of abrasive used and the highest speeds, and, by dilution, still retain a degree of strength relative to the finer abrasives.

The first step in the preparation of glue is to keep the glue in a dry place. Do not permit it to become moist or mouldy and lose its strength. Next is the soaking and for this purpose cold distilled water should be used. In factories employing steam heat, the drip from radiators can be used without disadvantage. Any grease that may be present, due to boiler compounds, are in no way detrimental to the glue.

SOAKING GLUE

The reason distilled water is preferred and oftentimes necessary is to avoid any possibility of chemical reaction, due to the presence of lime in the water, sulphur, iron or other elements which may be unknown to the user but which have a serious effect upon the glue.

The next step is to soak the glue. To do this properly and to secure the greatest strength from the glue liquor after it has been melted, an amount of water in proportion to the dry glue should be used, equal to that amount of water which was extracted from the original glue liquor in reducing it to a solid.

If that original glue liquor could be used, in its orginal condition, it would be the strongest glue possible to obtain, but it could not be transported in the liquid state.

Cake glue from ¼″ to ½″ thick requires about 12 hours to soak. It is better, however, to break the glue up into small pieces for the reason that upon placing it in a pail or receptacle and adding to it a proper amount of water, the water may not cover all the glue, and, therefore, it will not be properly soaked.

Flake glue according to its thickness will usually be properly soaked up in about six or eight hours, while ground glue will require from about three to three and one-half hours.

Do not be impatient to hurry any of these processes. You are dealing with nature and nature must take its course. When you try to deflect nature from its normal path, you are inviting trouble and you will usually get it.

It is good practice to have in the glue room, substantially made receptacles or measures which will hold say one pound of dry glue and one to hold one pound of water.

MELTING THE SOAKED GLUE

Melting the soaked up glue is the next step, and this should be done in small quantities.

I start on the basis that glue under heat loses its strength rapidly after four hours. Therefore, the form of glue heater that should be used is that which will provide for small batches of glue, each to be used within four hours and permitting a new batch to be under heat and ready before the first batch is used up.

Glue which has been under heat at the end of the day and is remelted the next morning has lost approximately 50 per cent. of its strength, and a little attention to the quantities of glue melted up, will soon enable an operator to eliminate the waste at the end of the day.

The glue heater pots should be of aluminum for the unctuous or greasy nature of aluminum automatically prevents the scum from the thickened glue adhering to the inside of the pots.

The temperature of the glue at the bottom of the pot should never be over 150 deg., and with the pot 6″ deep, the temperature at the top will be about 140 deg. to 142 deg. when it is 150 deg. at the bottom.

APPLYING GLUE TO POLISHING WHEEL

We now arrive at the point in which the glue is taken from the glue pot and applied to the polishing wheel in connection with the emery or abrasive.

*From a paper on the Metal Finishing Industry, read before the Meriden Branch, American Society of Mechanical Engineers.

The first thing that we must make sure of is that there is no draught in the room, however slight, and, as stated before, the room should be arranged so that even in the summer time ventilation can be provided without a draught.

When the glue brush is raised from the glue pot, it is immediately subjected to the influence of the difference in temperature between that of the glue pot at say 140 deg., and that of a normal room of about 70 deg.

In other words, there is a chilling action equal to a difference of 70 deg. of heat. This has a serious effect upon the glue.

The glue should be applied to the wheel just as quickly as possible and the wheel should have been heated so that the chilling or cooling of the glue is gradual. The abrasive should also be heated and both the wheels and abrasive should be at a temperature of at least 120 deg., so as the wheel sets in the wheel drying room, the glue, the wheel and the emery will all cool together at the same rate.

The setting of the glue should not be hastened. There are two distinct actions which take place in the wheel drying room. One is that the glue dries out—the other is that it sets and hardens. The two actions are distinct and while the glue cools in two or three hours, it does not set thoroughly inside of forty-eight hours so that it is hard enough to resist the heat of polishing friction.

Any artificial heat or a draught tending to hasten or cool the setting of glue, has a peculiar effect upon the glue. For illustration, take a diamond ring, with the diamond held in place by the gold prongs surrounding it. Let the gold prongs of the ring represent the glue and the diamond a grain of abrasive material. If the glue is left alone to set in its own natural way, it will close in and around the grain of the abrasive, just as the prongs surround and close in upon the diamond, but should the setting of the glue be interfered with or hastened, the glue will shrink within itself and leave the diamond lying idly in a little cup-shaped receptacle without support and having no holding power.

This can be easily demonstrated by any one in practice. To go back a moment to the question of applying glue to polishing wheels. It is a far better method to place some of the glue in a pan and roll the wheel on an arbor so that it takes up the glue evenly throughout the face, for even with the best intention, the operator will brush out the glue with a brush, will distribute it unevenly and it will not be in a proper condition to hold abrasives.

OVERHEATING GLUE

One of the worst conditions in handling glue is an idea that it does not seem possible to get out of the minds of the operators that intense heat in the glue produces strength. That is absolutely untrue; in fact it is exactly the reverse—heat instead of producing strength in the cooking of glue consumes the strength of the glue.

I have asked many an operator why his glue kettle was boiling and the usual remark is—"Oh, I boil it a long time to get all the strength out of it," and he does actually get all the strength out of it, but he does not mean it in that way.

It is one of the hardest points we have to impress upon the glue men that coolness adds strength to glue and that heat destroys the strength.

QUANTITY OF WATER NECESSARY

Now, to revert back to the question of how much water the glue should be soaked up in. This is controlled entirely by the amount of water evaporated from the glue in its manufacture during the process of reducing it from the original glue liquor to the solid commercial form.

Every pound of dry glue will take just so much water to restore it to liquid glue, and this varies so much with different glues that the only safe procedure is to ask the maker of the glue to give you the figures. Even then you are not sure that you are right because every maker of glue wants to make a point of the fact that his glue is cheaper than the other fellow's, because it will take so much water per pound of dry glue, and in direct connection with this is the avowed policy directly stated to me in many cases that the makers of glue know nothing about polishing and cannot and will not give any more advice for polishing work than they are absolutely obliged to. They never offer it, and when they are asked for it, they give it begrudgingly. As one man representing one of the largest glue houses stated to me—"Why, if I were to even attempt to cure the troubles in polishing rooms where I sell glue, I would be so busy that I would have no time left to sell glue—therefore—I leave it alone."

OPERATORS' IGNORANCE

So you will see that the poor operator is not to be blamed, because he is denied access to the only source of knowledge he knows about and is left high and dry in the air to his own devices.

The so-called glue apparatus used in polishing rooms runs all the way from a big iron kettle, holding enough glue for a week's supply, down to one installation I recently saw of an empty tomato can set on top of a 3" cast iron tee with a blow pipe flame shooting into the branch outlet of the tee. In a factory, supposed to be up-to-date, at one time, I had to walk uphill on the accumulated glue on the floor to get at the glue pot.

Several years ago I accepted an invitation from an engineer of an old concern making high-grade silverware, to spend a day at his plant in relation to his metal finishing processes. Upon arriving at the plant, he turned me "loose" in his polishing department to see what they were doing. The foreman of the department was a typical old-time New Englander, a man about 65 years of age, and with him was his son a man about 30 to 35 years old.

According to their version of their business, they were so absolutely letter-perfect in their processes that there was no argument to be had, so I asked them to show me how they prepared their wheels for trimming the flash from forks.

This gave them an opportunity to demonstrate their wonderful ability developed during the life time they had spent in that plant, and I followed it closely. The proposition was putting a paste head on a formed wheel. They mixed their emery in the glue, showing me carefully just how they did it—they showed me how they handled their glue—they set up a wheel—trimmed it to shape with a templet and started to grind forks without giving the wheel five minutes to set.

I mildly suggested to the old gentleman that it appeared to me that he was simply scraping off the emery and glue he had just put on and asked him why he did so. He said—"Oh—that doesn't matter—we save time by starting right in just as you see us."

The whole process was a typical demonstration of the ignorance, prejudice and self-satisfaction displayed, which is encountered in a great many plants, and it is almost a sickening proposition to attempt to do anything with people of that sort.

I told the engineer that there was nothing I could say to those two polishers—no argument would ever prevail with them—they were past the point of learning new tricks and the only thing he could do would be to put some competent engineer in charge of that department, with authority to clean it out and put it on a proper basis.

Horizontal Versus Vertical Hot Galvanizing Kettles

Difficulties Encountered When Coating Long Shapes, Such As Gas Pipe, Tubes, Leaders and Rolling Shutter Slats, Are Easily Overcome When the Perpendicular Type Is Used

Written for The Metal Industry by WM. H. PARRY, Foundryman

Fully realizing that to the average galvanizer or zincer, the mere mention of a zincing kettle in successful operation, though standing in an upright position, means a red hot argument as to the utter impossibility of any such device being successful, it is recorded here that such is the case, and in Boston at that. Very recently at the behest of a misguided friend who in a very rashy moment had recommended the writer as a consultant on zincing problems, it was made evident that both had made a serious blunder in not first consulting a specialist in diseases of the brain. Instead of being in a position to give sage advice on hot zincing kinks, I must confess to being suddenly made aware of a mysterious but real up-to-date method of zincing "long shapes" without danger to the operators, and those in the immediate neighborhood of the plant rigged up for such work.

The problem in question was the proper coating of rolling shutter slats, so that the hinge holes, not exceeding three eights of an inch in diameter, and running, say from four feet to twenty-two feet in length, would coat evenly, and not be choked with frozen metal, dross, salammoniac, and the muriate of zinc in extreme cases. Now, it would seem on reflection that to coat such shapes, and indeed any tubular forms of small diameter, and of a length 128 to 682 diameters, so that no obstruction of any kind would prevent the proper assembling or meshing of one into the other, was impossible of attainment when kettles of the "now-I-lay-me-down-to-sleep" type were used. And, so it has been proved, not however in the sense that all work of that nature is spoiled, but that the chances for an even coating are very slim indeed.

Let us for the moment try to describe what happens when a piece of piping is being zinc coated, even when the kettle length exceeds that of the pipe (and such is not always the condition). Assuming that the pipe has been properly pickled and fluxed, one end of the pipe is placed into the lathe at an angle sufficient to keep the open end free, so that the air and heat generated gases will escape as the molten metal enters. Great care must be exercised that all such have escaped, before dropping the free end into the kettle, as violent and dangerous explosions result from trapped gases. The pipe being submerged in the clean metal and not allowed to get into contact with the dross, is then drawn out at an angle that permits the excess metal to flow back into the kettle, and this apparently simple operation is not always unaccompanied by danger.

An examination of a sample slat about eight feet long showed a perfectly even coating throughout and the owner of it remarked that he had been told that the parties responsible for it were operating a zincing kettle ON END! Candor compels the statement to be made, that such a revolutionary method of accomplishing zinc coating was a new one on the writer, but a further and closer inspection of the sample revealed the indisputable fact that by this method, **and no other,** could such splendid work be produced. It seems that the local jobbing galvanizers to whom this work was entrusted, did on occasion coat the slats so that the holes were not filled up in spots. But, as this happened but rarely, the firm manufacturing the rolling shutters, were compelled to seek other fields in their search for somebody capable of turning out one hundred per cent perfect work. Finally they located a concern in Boston that made a practice of showing up the local gentry by shipping back to New York as many slats as received, and each one a work of art.

Thinking it would be a wise move to find out how the Bostonians were operating their plant, so that the local jobbers could be instructed as to their nefarious practices, a member of the firm made the pilgrimage to good old Beantown to gather the necessary information, only to be told that nobody was allowed inside their works, but those employed therein, except, that the bosses of that particular plant would stroll in every now and then, just to be sociable. It was explained also, that there was no objection to the Bostonians as such, but the delays incident to shipping the goods both ways, and the high freight charges, cut into the profits and patience of the New York manufacturer, so that it was highly desirable to have the local jobbers handle the work. When it was intimated to the home jobbers that the Bostonians were so far ahead of them, that they even set their kettles at right angles to the way the Gothamites were doing, he was given the merry Ha! Ha!, and told that such was an absolute impossibility.

Nevertheless, that's the way they do it in Boston, at least in that plant, and the evidence is incontrovertible as shown by the sample examined by yours truly. Near one end of the slat was drilled a hole, so that a hook or wire could be passed through to lower and hoist the piece into and out of the molten metal. And as further indisputable evidence the same end of the slat was slightly discolored by contact with salammoniac, showing, that it lingered for a while on the way up, or, before same was skimmed previous to the "draw up." Again, aside from the discoloration on the drilled end, the "feel" of the salammoniac was present for the same distance down as the discoloration.

I am sorry that I can not give definite details to the readers of THE METAL INDUSTRY as to the exact design of the Boston plant, for very obvious reasons. But, as it is not a crime to take a guess or two as to how they do it, suppose we delve into the subject in the hope that somebody in Boston will enlighten us later on.

If no dross formed in a kettle, the vertical type would lend itself to very easy designing. But, as dross will form in the best regulated kettles either prone or upright, the big proposition, is, the handling of this material in such a manner that it can be removed when it builds up to a height that makes good coating impossible. Now in the ordinary kettle, perforated scoops are used, and at best, it is a slow and laborious process, involving much patience and considerable muscle. But in the vertical type, its removal means that the cost of the labor in doing so, assuming that they do use scoops, would be prohibitive, and in my opinion impracticable. As zinc dross is barely fluid when hot and flows very sluggishly, it follows that any means to the end of flowing it off through a tap hole, such as used in cupolas, is entirely out of the question, even if the tap hole were made of generous proportions. Then again the ever present danger of its freezing in the passages eliminates the possibility of that method.

The probability of a dross chamber connected with

the kettle by a valve or gate controlled passage would seem to be one means of solving the problem; also, a cannon-like kettle with trunnions so placed as to make it possible to spill out the clean metal into a mobile container heated to keep same fluid, with the dross to be dumped into another, so designed as to form it into slabs of marketable dimensions. The problem of firing and heating a vertical kettle is not very easy to solve, unless oil or gas are the fuels used, and then only if the design of the kettle is such as to be, one cylinder inside of another with the fire between both; or, on the inside of the interior cylinder with the space between both cylinders given up to the metal.

Nevertheless, the Bostonians have solved this problem and are profiting thereby on classes of work that others cannot approach.

Silver Plating Cutters

An Answer to F. C. Mesle's Article on This Subject*

Written for The Metal Industry by C. H. PROCTOR, Plating-Chemical Editor

I am going to refer now to the bone of contention that was published in September, 1922, issue of THE METAL INDUSTRY and I am going to try and prove to Mr. Mesle's satisfaction that no mention was ever made of "a perfect working silver solution containing 2 ozs. of silver per gallon wherein it was possible to use 24 amperes on a dozen steel knives."

Anyone who will take the time to read the article on page 353, September, 1922, issue of THE METAL INDUSTRY, will note that the heading reads "Various Plating Problems." It was not written as a standard article on silver plating of steel knives as no mention is made of a steel knife. The article consisted of a series of questions and answers to an unusual current and solution condition. If the questions and answers are read intelligently, it will be noted that to give results, 6 volts were required to plate one knife with fairly successful results.

The solution was a conglomeration made up mostly of chlorides of silver, some nitrates, some ammonia and some caustic potash. The amount of metal in solution, so far as the writer was concerned, was an unknown quantity. It might have been 2 ozs. or 10 ozs. The cyanide content was likewise unknown. The gentleman asking the questions was not a plater, but he had devised a method of coating old worn silver-plated knives with a molten alloy of 90 parts tin and 10 parts silver. The alloy gave a perfect coating that filled up all the pores and pin holes and gave an unusually good finish. The alloy, however, was hard and therefore, could not be burnished, so experiments were made with the solution as outlined to obtain a silver deposit of no particular thickness, only sufficient to burnish. The proposition was an unusual one and interesting and I gave more than the usual response to the inquirer's questions. The point objected to by Mr. Mesle is only a small part of all the questions asked and answered.

Now as to the answers: (1) The voltage of 1 to 1½ should show at your plating tank connections, although with a perfect working silver solution ½ to ¾ volts at the proper amperage would be ample. Three amperes is too low for half a dozen knives (this part of the question referred to the tin silver coated knives and not to a bare steel knife). Under correct conditions, 12 amperes would be more nearly correct for a half a dozen knives. It is the ampere that deposits the silver. The volt is only the pressure behind the amperes and overcomes the resistance. ("No mention is made of a perfect working solution here.") Under correct conditions 12 amperes would be more nearly correct. Under correct conditions, Mr. Mesle mentions 100 times greater than is given in the usual works on plating.

In answer to question 3. "The heavy white clam shell color you mention depends to a great extent upon the composition of the silver solution. Ordinary chloride of silver dissolved in sodium cyanide gives such results but the deposit is not as adherent as when silver cyanide and sodium cyanide are used. However, a few drops of silver brightener per gallon will change the clam shell white to what is termed in commercial parlance a skim milk color. The latter color is the best for knives and forkes." (In this instance I did refer to silver plated steel knives).

In answer to question 4. After mentioning current conditions as probably the cause of peeling, I continued that if three amperes will plate one knife satisfactorily, then three additional amperes will be required for every other knife put into solution or nearly that much if he wanted to obtain the same results. If the generator only developed three ampheres in all, then it was not suitable for the purpose. The balance of the answer was devoted to the discussion of tanks and the excess voltage causing a change in the anode condition and mentioned that 6 volts was too high a pressure. It causes the silver to become pulverulent which might be termed a burnt deposit.

Answer 5. Peeling was taken up as well as burnishing and mention was made that "scratch brushing of the silver deposit does not prove that the silver deposit is absolutely adherent."

Answer 6. "The solution as used by you is not a good combination. A solution of two ounces of silver per gallon should be prepared as follows:

Water	1 gallon
Sodium Cyanide	3 ounces
Silver Cyanide 80%	2½ ounces
Carbonate of Potash	1 ounce
Silver Brightener	1 to 2 drops

No mention was ever made that the above formula was a perfect working silver solution for silver plating steel knives at the rate of current density of 24 amperes per dozen.

It is only fitting that an explanation should be given. In the first place, as Mr. Proctor states, the original questions and answers, as published[1] formed only a small part of the correspondence between himself and the inquirer. To publish the whole affair would have been impossible; it would have filled a dozen pages. Therefore a part was chosen which would be, as nearly as possible, representative. The problem was a most unusual one. It was not an open and shut proposition of silver-plating knives. There were, as may be easily seen from the different types of questions printed, many unusual circumstances. That Mr. Proctor's suggestions were helpful is proved by the replies from his questioner. That Mr. Mesle's contentions are correct under other circumstances, is fully within reason. It seems, however, that this discussion, like so many others, has drifted far from its original base. It seems wise, therefore that it should be closed.—Ed.

*Previous statements in this discussion have been published in THE METAL INDUSTRY for January, April and May, 1923, and in the *Monthly Review* for November, 1922, and February, 1923.

[1] THE METAL INDUSTRY, September, 1922, p. 353.
[2] THE METAL INDUSTRY, January, 1923, p. 21.

Notes on Melting and Pouring Brass and Bronze

The Essentials of Good Foundry Practice as Carried on in a Large Modern Plant*

By F. L. WOLF[1] and WM. ROMANOFF,[2] Mansfield, O.

Following is the order in which the subjects are discussed:

1. Pouring temperatures.
2. Comparison of melting furnaces.
3. Mixes.
4. Fluxes.
5. Deoxidizers.

POURING TEMPERATURES

We can not think of any single operation in the foundry that has more influence in determining the quality of the ulimate finished product than that of pouring at the proper temperature.

If, in order to obtain a better metal, you took the necessary steps, while melting, to see that your molten metal was properly covered and that it was not permitted to "soak" in the furnace; you saw that the furnace had the proper atmosphere, whether it be oxidizing, neutral or reducing; you used any type of furnace, whether it be open-flame, crucible or electric; you used any mixture of scrap and virgin metal; the results of all these precautions would be offset if the metal were poured at an improper temperature. This statement may at first thought appear to be ambiguous, but upon further analysis you will no doubt agree. Or better still, a trial will surely convince you.

In our brass foundry we manufacture valves, line material for electric railways, mining material, etc. To show the effect of pouring at the wrong temperature, let us consider the case of pouring one of our alloys. In this particular case we used 50 per cent virgin metal and 50 per cent gates and sprues from our own foundry. Merely a difference of 100 degrees Fahr. between the proper temperature, which we will designate A and the improper temperature, which we will designate B gave us the following difference in physical properties:

TEMPERATURE	TENSILE STRENGTH IN POUNDS PER SQUARE INCH	PER CENT ELONGATION IN 2 INCHES	PER CENT REDUCTION OF AREA
A	27,550	14.6	15.3
B	16,316	7.5	6.4

The same furnace conditions were maintained in each case. In fact we poured A and B from the same pot of metal. Test bars and castings were poured at temperature B and the remaining metal chilled down with gates and sprues to temperature A and poured. And still we hear of salesmen selling a cheaper grade of brass products accentuating the fact that their material is as good as their competitors because it has the same composition. To us, it is amusing. It could be likened to comparing two different makes of automobiles because their bodies happened to have the same color, workmanship to the contrary.

The above results are consistent with theory and with the results we have obtained in practice in our foundry since the introduction of temperature control. Molten metal has a tendency to absorb gases, the higher the temperature, the more gases absorbed. Upon cooling these gases are given off. When pouring a casting, the outer surface solidifies first. Therefore, the higher the pouring temperature the more gases entrapped between the crystals of the metal and necessarily the less dense and more brittle it will be.

When our castings leave the foundry, they are sent back to the brass casting department where the castings are cut off from the gates, after which they are rough ground and sandblasted. They are then inspected and divided into the following groups: misrun, dirty, shifted and good castings. Shifted castings are due to faulty molding or pattern equipment and will be eliminated from this discussion. We find that the percentage of dirty castings is greatly increased when poured at too high a temperature. This is accounted for as follows: If the metal is excessively hot, the temperature is such that it retains the oxides and other impurities in a fluid or plastic condition. When pouring the metal in such condition, the surface of the metal in contact with the mold solidifies, thereby entrapping oxides and impurities and causing "dirty" castings. If the metal is chilled to proper temperature the oxides and other impurities are permitted to solidify and due to their lower specific gravity float to the surface. The slag can then be readily skimmed off. If the metal is too hot, it also has a tendency to "eat" into the sand, causing rough, dirty castings. On the other hand pouring the metal too cold, is likely to cause "misruns".

We might sum the entire question of pouring temperatures into the statement that when metal is overheated or permitted to "soak" in the furnace for too long a time, there is gasification of the metal instead of an oxidation which is generally supposed to be the case. That probably accounts for the fact that upon chilling an overheated metal, it practicaliy returns to its normal state. In passing, we might add that the pouring temperature should be as low as possible, consistent with the size and shape of the castings in order to obtain the best possible physical properties.

COMPARISON OF MELTING FURNACES

There is always a question as to the quality of metal produced by different types of furnaces. In our brass foundry we operate three types of furnaces, the open flame type as represented by Schwarz furnaces, the crucible type as represented by Steel-Harvey furnaces and the electric as represented by an indirect arc type furnace. As the management insists that everything be subservient to quality in the manufacture of our products, we have experimented extensively to determine whether one or more of these types of furnaces should be eliminated from our foundry due to producing an inferior grade of metal. At this writing we have also installed an electric furnace of the induction type, but, as yet, we have not enough data to allow this to enter into a comparison with the other types of furnaces.

COSTS

Let us first consider costs. This is the standard upon which the majority of concerns base their conclusions as to whether any equipment or process is to enter into production. It is especially prevalent among the smaller concerns. But as this is not a discussion

*A paper read at the Cleveland meeting of the American Foundrymen's Association, May 1, 1923.

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of business economics we will get to the point in question. At our plant the cost of melting one ton of metal in electric, Schwarz and Steel-Harvey furnaces is as follows:

[a]Electric	$22.99
[a]Schwarz	20.38
[a]Steel-Harvey	17.86

This comparison includes fuel, labor, lining, melting losses, crucibles, and all other incidental items necessary to melting metal, and was compiled during a long period of time. In addition the slag recovery is also included as we operate a concentration plant. Space does not permit us to itemize the individual costs.

QUALITY

A comparison of the quality of the metal melted in the above mentioned three types of furnaces will prove interesting as well as surprising. In fact it is contrary to the opinion which is almost universally prevalent among foundrymen about the decidedly superior metal obtained in an electric furnace as compared to other fuel fired furnaces. We direct your attention to the following comparison:

FURNACE	ULTIMATE TENSILE STRENGTH IN POUNDS PER SQUARE INCH	PER CENT ELONGATION IN 2 INCHES	PER CENT REDUCTION OF AREA
Electric	28,587	18.1	18.7
Schwarz	27,655	14.7	14.0
Steel-Harvey	26,800	16.1	15.2

While the advantage seems to be slightly in favor of the electric furnace, we think it is so small that it need hardly be considered. But we must admit that the electric furnace is by far the more fool-proof. Proper furnace conditions as well as pouring temperatures must be maintained in order to obtain as good a quality of metal from the Schwarz and Steel-Harvey as from the electric. Wherever possible, comparisons were made upon the finished castings poured from the various furnaces and any difference in quality was hardly noticed.

Another phase which is coming into consideration, more and more every day, is that of zinc fumes. From a humane standpoint this must be considered. If you have ever worked in a brass foundry during the winter time with all the doors and windows closed tight, you will readily agree as to the necessity for considering this feature. Zinc "shakes" are not pleasant. The electric furnace with its sealed melting chamber is far superior in eliminating this evil. We might add that with labor at a premium as at present, working conditions should be such as to keep the minds of the employes in a contented state and the electric melting furnace is a step in the right direction.

MIXES

Every foundry that operates a machine shop has a continuous influx of brass borings and turnings to be remelted. In addition there are the gates and sprues which have been cut off from the castings. As near as possible it should be the aim to consume all of this scrap material in the foundry in the same proportion as it is received, thus avoiding any unnecessary accumulation. This greatly reduces the cost of the raw material as compared to what it would be if all virgin metal were used in the manufacture of your castings.

[a]Power for electric furnace has been figured at the rate of 2 cents per K. W. H. Fuel oil for Schwarz and Steel-Harvey furnaces at 6 cents per gallon.

We, therefore, had to do considerable experimentation to determine whether this scrap would be detrimental to the metal, and if not, in which proportions it could safely be added. In carrying out these experiments, all melting and pouring conditions were maintained as uniformly as possible, the only variations being in the combinations of metals, one consisting of all prime metal, one of equal parts prime metal and scrap, consisting of gates and sprues, and one containing all scrap, consisting of gates and sprues. The following results were obtained:

MIX PER CENT PRIME	MIX PER CENT SCRAP	ULTIMATE TENSILE STRENGTH IN POUNDS SQUARE INCH	PER CENT ELONGATION 2 INCHES	PER CENT REDUCTION OF AREA	BRINELL HARDNESS
100	0	37,050	23.4	21.2	72
50	50	34,500	21.1	21.0	68
0	100	38,566	22.9	21.1	68

While there is a slight reduction in the ultimate tensile strength when using half scrap and half prime metal, still there is no radical difference. The elongation, reduction of area and Brinell hardness are practically the same using any of the combinations.

In another case, we used combinations of prime metal, scrap, such as gates and sprues, and composition ingot metal purchased from various smelting and refining companies. These were used in the melting of one of our brass alloys. Composition ingot is usually obtained by the refining of concentrates, borings, turnings, etc. The following results were obtained:

MIX PER CENT INGOT	MIX PER CENT SCRAP	MIX PER CENT PRIME	ULTIMATE TENSILE STRENGTH IN POUNDS PER SQUARE INCH	PER CENT ELONGATION IN 2 INCHES	PER CENT REDUCTION OF AREA	BRINELL HARDNESS
0	33	67	24,450	14.3	13.0	52
25	27	48	23,841	13.2	9.4	54
50	33	17	23,266	12.2	10.1	50
75	0	25	26,800	16.1	15.2	48

There is some variation in the reduction of area but the remainder of the results are fairly consistent.

In the combinations of scrap and prime metal used, one thing must be taken into consideration, and that is the fact that when all other conditions are equal, there is a greater shrinkage in the castings the more prime metal used in the mix. Several theories have been offered by others to account for this. We offer no explanation. We know that it is a fact.

The sum and substance of the whole subject of mixes can be simmered down to the following: Any reasonable combinations of prime metal and scrap can be used providing there are not too many detrimental impurities present such as antimony, iron, etc., and that proper foundry conditions have been maintained. In our foundry we have been obtaining consistently good results by using any number of combinations. We aim to use up our scrap just as fast as it is received in the brass foundry and we make up our mixes accordingly.

FLUXES

We do not wish to put ourselves in the position of belittling any flux. Probably we do not know how to use of flux. In our investigations, we merely carried out implicitly the written instructions of the flux manufacturers. And in each case the physical properties were no better with the use of a flux than without. All other foundry practices were the same in both cases. We experimented with two fluxes of national reputation, or rather, two fluxes that are nationally advertised. Then we stopped. We were convinced, but in a disappointing way. After reading the lurid

advertisements of the different fluxes, we expected considerable improvement in our metal upon usage. Probably we expected too much. It may be good business psychology to tell your customers that in the manufacture of your product you use the best and highest price fluxes obtainable but psychology never prevented "leakers" in valves nor increased the toughness of a trolley wheel.

In the melting of our brass or bronze alloys, we melt the red metals first and when molten, we add the white metal. About 5 to 10 minutes later, we pour. In the interim between adding the white metal and pouring, we add a little sand as a covering to prevent as much volatilization of zinc as possible while the metal is molten. That is the only flux that is used in our foundry.

We might add that if the foundry uses scrap of unknown quality and the melting conditions are questionable, there might be some advantage in using fluxes as scavengers. If your foundry practice is under control and you are using a high grade scrap of known analysis, we use nothing but our own domestic scrap in our foundry, there is no particular advantage in using these high priced fluxes.

DEOXIDIZERS

We have always obtained good results by the use of deoxidizers but like most good things, an excess may often prove deleterious. We feel that in general, the choice of the specific deoxidizer depends a good deal upon the individual user in which psychology plays a very important part. Without belittling any of the other standard deoxidizers on the market and appreciating their specific worth to the industry, we have found phosphor copper containing about 8 to 10 per cent phosphorous to be the most practical in our foundry. We add a fraction of an ounce per pot of metal, containing 100 to 150 pounds, and it is added just before pouring. But as we hark back to occasions when an excess of this "good thing" was added, we can recollect the following grief: the metal became so active it "cut" the sand in our molds causing rough, dirty castings; castings deteriorated due to the formation of the hard brittle Cu_3P compound; in the high lead alloys the lead segregated to the outer edge of the castings ruining appearance, where this property is essential, and often causing porous metal.

Aluminum as a deoxidizer should never be used in an alloy containing lead as porousness is almost certain to occur and if the alloy is to be used to withstand any internal air pressures, it would spell certain ruin.

Silicon in a brass containing lead should also never be considered as a deoxidizer. In fact it should never be considered in any copper alloy where electrical conductivity is one of the properties desired.

In passing, we might state that the writers have always found the use of a deoxidizer to be desirable but its choice and use must be tempered with good judgment or the good judgment of your customers will eventually decide for you by choosing another foundry to manufacture their castings.

CONCLUSION

We hardly feel that in this short discussion we have covered all of the minor details that would occur in one's experiences in a modern brass foundry, but by accentuating the major problems as has been our endeavor, there is a possibility that the minor problems might thus have been taken care of. We have tried to emphasize the following points:

1. The pouring temperature should be as low as possible, consistent with the size and shape of the castings.

2. With proper foundry conditions, practically any type of melting furnace can be used to obtain a good quality metal. The cost of melting varies, dependent upon the type of furnace. From a humane standpoint we prefer the electric furnace due to its lower melting losses and elimination of a large amount of zinc fumes.

3. Practically any reasonable combination of prime metal and scrap such as gates, sprues, borings, turnings, etc., can safely be used provided they do not contain any detrimental impurities.

4. Good metal can be obtained without the use of fluxes if proper furnace conditions are maintained. If not, fluxes might be of value.

5. Deoxidizers have been proven worthy. The kind to use depends upon the kind of metal melted and the prejudices of the users for or against certain ones. This should be tempered with a fair amount of good judgment.

Fortunately for the industry, we are disregarding more and more the traditions which have been prevalent among foundrymen for decades. We are beginning to realize that there is nothing supernatural about the workings of a foundry and that the supposed mysticisms which have been handed down from fathers to sons and they in turn to their sons and so on down the line are purely and simply imaginative and things of the past. Foundrymen realize today that they can account for practically everything that occurs in a foundry. They realize today that practically all of the processes of manufacture in a foundry are founded upon good sound principle and theory and upon this foundation have they built an industry that is gaining its deserved recognition from the world of science, art and business.

DISCUSSION

Clifford B. Cornell stated that the fluxes manufactured by him were giving satisfaction to scores of foundries. He stated also that his fluxes work well when properly handled, and gave a list of most of the larger users and the quantities used.

G. H. Clamer remarked that there were good and bad fluxes, and that there was a time to use them and a time to leave them alone. A Committee for the American Society for Testing Materials was working on this problem and investigating the fluxes and flux materials.

G. F. Comstock said that it was possible to make good conductivity copper castings with the use of silicon providing the proportions were correct.

H. M. St. John thought that the paper should have mentioned that the electric furnace in use was not the indirect arc type but the smothered arc type. The cost figures given would not hold good for furnaces of the indirect arc type.

Dr. P. D. Merica asked if the castings produced could stand water pressure.

L. W. Olsen answered that they could whether made in one sort of furnace or another.

W. Romanoff stated in answer to a question that in making these investigations he had used a Hoskins pyrometer calibrated against a Leeds-Northrup potentiometer.

White Metals

A Review of the Principal Classes of White Metals, Their Composition and Physical Properties, Chiefly in Relation to Their Uses and Manufacture.—Conclusion*

By A. H. MUNDEY, C. C. BISSETT and J. CARTLAND

FUSIBLE ALLOYS

Fusible alloys can be manufactured with any desired melting point from 60° C. upwards. The best known being Woods' alloy, containing bismuth 50 per cent, lead 25 per cent, tin 12½ per cent, cadmium 12½ per cent, which melts at approximately 70° C. The application of these alloys is now limited to the manufacture of sprinklers for fire-alarms and other special uses.

During the war fusible alloys had an interesting and extensive application in the manufacture of aeroplane tanks of complicated design. A solid casting was made in fusible alloy the shape of the required tank, this was then immersed in a copper-plating bath, and the necessary thickness of copper to form the tank deposited thereon, the whole was then placed in boiling water and the fusible "core" melted out.

ALLOYS FOR CHEMICAL VATS, ETC.

The employment of lead-antimony alloys for valves, cocks, pumps, and similar gear for use in chemical works with acids and other corrosive liquids is very common and well known. The authors have, however, been engaged during the past two years in a considerable extension of this class of work. It has been found possible by the careful elimination of impurities, such as oxides, sulphides, traces of zinc, etc., to produce alloys with antimony content (varying according to the type of service) of from 6 per cent to 8 per cent, which are equal to sheet lead in resistance to corrosive fluids, and which are capable of being cast into large vessels, such as vacuum evaporators, acid eggs, and tanks up to 10 tons in weight. The tensile strength varies from 3.98 to 4.28 tons per sq. in. Castings are reasonably rigid and sharp. The chief advantage to the chemical engineer, however, is in the replacement by these alloys of iron or steel vessels lined with sheet lead. In the use of the latter, the iron casing expands and contracts with varying temperatures, but the sheet-lead lining expands but does not resume its former dimensions on cooling; gradually this cumulative expansion causes folds or creases, and subsequently cracks appear and the acid or other corrosive fluid attacks the casing, with serious results.

The temperature of pouring should be as low as possible, consistent with perfect fluidity, and arrangements should be made to effect rapid cooling, as a fine uniform structure is an important feature in the resistance to action of corrosive fluids. The built-up tank from plates cast in iron molds is therefore to be desired.

DIE-CASTING ALLOYS

The production of spacing material for printers is probably one of the earliest commonly used examples of die-casting, the operation being carried out under pressure in specially designed machines, but as this is for a specialized industry it has never been regarded as die-casting in the sense of the present use of that description.

The white metal alloys used in die-casting for general engineering productions are numerous; they include (*a*) zinc-base, (*b*) aluminium-base, (*c*) tin-base, and (*d*) lead-base alloys.

Actually the subject covers such a wide field that a whole paper could be devoted to its consideration. In view of the fact, however, that at the present time several committees, composed of users and producers, are studying this matter with a view to the standardization of methods and information, it is not proposed to discuss the metallurgical aspects of it further.

The production of die-castings on a large scale is still in a limited number of hands. The designers of tools and machines, the more highly skilled tool makers and also casters form a comparatively small fraternity. Experience in the construction and material of the dies, the selection of alloys, casting temperatures, and pressures is all important, and no descriptive directions can possibly replace it.

The much-abused method of trial and error, otherwise exhaustive experiment, is frequently the only one possible in the production of difficult die-castings in so far as the determination of best form of gates, temperature of casting, and similar details of workshop practice.

The tools for this work are generally of mild steel or cast iron, with special parts of tool or high-carbon steel. Alloy steel, vanadium, or nickel-chrome are occasionally used, especially for pressure cast aluminium base alloys. The high cost and also the difficulty in using alloy steel limits their general use. The problem of melting-pot material for the aluminium alloys is by no means solved. The authors have tried practically every well-recommended iron or nickel alloy; none so far has proved to be quite satisfactory. The aluminium gradually absorbs iron or nickel, in serious proportions.

PRODUCTION AND REFINING

Considerable experience in the preparation of white metals has led the authors to the opinion that the operations are best performed in gas-fired furnaces; in co-operation with the technical staff of the South Metropolitan Gas Company, furnaces and melting pots which are very efficient and economical have been devised.

Alloys containing copper required for hardening and similar purposes are prepared in a gas-fired tilting furnace. The addition of these hardening alloys is made to the bulk metal whilst both are in a molten condition.

The facility of control and the extreme cleanliness and convenience in handling are important features. The melting pots are bottom pouring, the valve being controlled in front of the furnace, mechanical stirring is not adopted, as it is considered that the intelligent interest and co-operation of the workman is retained more effectively when his whole attention is demanded in this important operation.

Actually in the cases of the selected workmen who are engaged, a very keen interest is shown in the quality of the product. Their quickness is detecting the presence of accidental impurities by the surface and fracture of the alloys is remarkable. The value of the intelligent co-operation of the operators in the production and refining of white metals is as marked as in any of the skilled industries.

In conclusion, the authors desire to express their thanks to Mr. John Fry, of Fry's Metal Foundry, for permission to present this paper and for facilities in its preparation.

*Parts 1, 2, 3 and 4 appeared in our issues of January, February, March and April, 1923.

The Silver Market

Comment on Approaching Completion of Silver Purchases Under the Pittman Act*

Before discussing the effect on the price of silver which the recent announcement by the Director of the Mint may have, we consider it advisable to review briefly the provisions of the Pittman Act itself.

This bill, which became a law in April, 1918, reads in part as follows:

"To conserve the gold supply of the United States; to permit the settlement in silver of trade balances adverse to the United States; to provide silver for subsidiary coinage and for commercial use; to assist foreign governments at war with the enemies of the United States, and for the above purposes to stabilize the price and encourage the production of silver."

Under the provisions of this act, silver dollars equivalent to a total of approximately 208 million fine ounces of silver were melted up and shipped to India for account of the British Government during the years 1918 and 1919.

In June, 1920, the Director of the Mint first accepted tenders of United States mined and refined silver under the terms of the repurchase section of the Pittman Act, and such purchases still continue.

On June 17, 1920, for the first time two quotations were made up of bar silver; one representing the price of $1.00 per ounce 1,000 fine paid by the U. S. Government for "domestic" silver, and the other representing the world market price for "foreign" silver.

The repurchase section of the Pittman Act authorizes the Director of the Mint to purchase at $1.00 per ounce 1,000 fine all silver tendered, when supported by proper affidavits proving that such silver had been mined and refined in the United States, up to an amount sufficient to replace the silver previously sold under the terms of the act—namely, 208 million ounces.

This amount of 208 million ounces has been reduced to 200 million ounces by the allocation to Pittman purchases of an amount equal to approximately 8 million ounces, perviously allocated to subsidiary coinage requirements.

In our "Review of the Silver Market for 1922," we recognized this reduction of the total purchases to 200 million ounces, by estimating the balance still to be purchased as 50 million ounces on the basis of approximately 150 million ounces already purchased to December 31, 1922.

On March 30, 1923, the Director of the Mint announced that purchases to that date amounted to approximately 180 million ounces, and that at the present rate of production the purchase of the balance would be completed about July 1, 1923.

The sudden increase in purchases between March 28th and 30th was due to the acceptance by the Director of the Mint of approximately 12 million ounces tendered by silver producers present at a conference between representatives of the Government and the smelting companies, held on March 30th.

This silver is not in refined form available for delivery as bullion, but represents silver content in ores or concentrates at the reduction works. The purpose in accepting silver in this form is to place all mines on an equal basis, and to prevent discrimination against those mines in the sale of their product whose bullion would take a longer period in refining, on account of the nature of the ores.

Due to various factors, such as inaccuracies in estimating actual silver content, and the fact that certain silver will be tendered for sale which has never gone to a smelter (product from cyanide or other processes), the exact date on which purchases under the Pittman Act cease cannot be determined until some time afterwards, but provisional settlement will be made on the basis of the world market price for "foreign" silver, and later adjusted when all data is available.

Based on the present rate of production, purchases by the Government under the Pittman Act will be completed about July 1, 1923, according to the recent statement of the Director of the Mint; but it must be borne in mind that actual deliveries of refined silver against these sales will not take place for several months to come, and the Director has set the final date for such deliveries as late as October 1st of next year.

There has always been considerable speculation as to how greatly the price of silver would be affected by the additional supplies from the United States coming upon the open market after the cessation of purchases under the Pittman Act, and undoubtedly the announcement of the Director of the Mint under date of March 30th, that only about 20 million ounces remained to be purchased, did have a sentimental depressing effect on the price of "foreign" silver.

However, in considering the influence upon the market, it must be remembered that this silver will not be available for some time, and then will come only in increasingly larger amounts which would tend to make any fall in price a gradual one, and not a sharp break as some appear to expect.

On the side of supply, there are two factors which will tend to check any fall in price. First, during recent months the mining of United States silver has increased considerably. This is due largely to the greater production of copper, of which silver is a by-product; but the approaching expiration of the Pittman Act undoubtedly is partly responsible for this increase. To the extent that the Pittman Act is stimulating production, its termination will restrict it, so that the additional supplies eventually coming on the open market will be less than recent domestic production figures would indicate; and secondly, any appreciable fall in the price of "foreign" silver will tend to reduce the Mexican output, as ores in that country are mined chiefly for their silver content, and such curtailment would have a strengthening effect on prices.

Furthermore, as noted in our "Review of the Silver Market for 1922," an analysis of statistics covering production and price discloses no apparent direct relation between these two factors. In the year 1912, when world production was at its height, and United States production was on the increase, silver reached a higher level than it had for several years previous; and subsequent to 1912 declined steadily, until the sustained advance brought about by war conditions.

It would appear that the controlling factor in the silver price is the demand from India and China, and the requirements of these countries depend in turn upon world conditions. The millions in the Orient probably give no thought to the expiration of the Pittman Act, and although speculators in Bombay and Shanghai may attempt to use the termination of the Pittman Act as a "bear point," any fluctuations brought about by their operations will be merely temporary and not based on fundamental economic conditions.

*From a pamphlet on this subject issued by Handy & Harman, New York.

THE METAL INDUSTRY

With Which Are Incorporated

THE ALUMINUM WORLD, COPPER and BRASS, THE BRASS FOUNDER and FINISHER, THE ELECTRO-PLATERS' REVIEW

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Contents

EDITORIAL

THE PLATERS' CONVENTION

In another part of this issue will be found a description of the plating industries of Providence, the city in which the annual convention of the American Electro-Platers' Society is to be held, July 2-3-4-5. Words of praise from us for the platers are unnecessary. We have many times expressed our admiration for the extraordinary advances made by the Society, and for the way in which the members have built up a technical organization in an industry which was formerly guided by the Rule of Thumb.

The convention is certain to be a success, in the first place because all of the platers' conventions are successful. It is not part of their make-up to hold an unsuccessful convention. In addition, however, there is the fact that at this particular time general business conditions are unusually favorable and a spirit of optimism and hope exists everywhere. Depending as it does upon manufacturing in general, the plating industry has risen sharply within the last few months. Although the American Electro-Platers' Society has no direct connections with business or finance, it does nevertheless feel their fluctuations. The present state of affairs should be conducive to a record-breaking attendance.

In view of this condition and in view also of the invaluable aid which the Society has given to platers and to the plating industry, thereby aiding the manufacturers, these manufacturers should consider it a part of their legitimate expenses to pay the way of their plating foremen and superintendents to the convention. It is common practice in all other industries for firms to pay the expenses of technical men to technical meetings. There is no reason why platers should not be in the same position. This is suggested, not simply to relieve the individual platers of expense, but to make it possible for more of them to attend the meetings, hear the papers and join in the discussions. We believe that the attendance of its plating foremen at meetings of this sort would more than pay for the cost incurred by any firm.

SHOP PROBLEMS

It has come to our attention that in connection with the controversy between Charles H. Proctor, our plating-chemical editor, and F. C. Mesle, the editor of the Monthly Review, a sharp division of opinion has arisen. Moreover, it has been stated to us, in private, that some of the platers as individuals have taken advantage of this situation to declare that one or the other has been "defeated," etc. It seems, therefore, to be in order for us to state our position both with regard to controversies in general and this one in particular.

We do not publish discussions for the sake of seeing anyone "defeated." We are not interested in "victories" or "defeats." We are interested only in arriving at the truth. So much for discussions in general. As regards this one in particular, we do not feel that it would be proper for us to express any opinion as to the rights and wrongs in the matter since it is in the hands of two experts and, as everybody knows, even experts may disagree. We do wish, however, to affirm our confidence in Charles H. Proctor. He had been answering plating-chemical inquiries for us for a number of years, with great success. We have received numberless letters of commendation and gratitude for his help. We feel certain that there is no practical plater in the country with greater ability to handle the variety of problems with the close detail necessary in order to be of real assistance, than Charles H. Proctor.

THE BEST BOOKS

A short time ago there was a flurry in the daily press concerning the ten best books in the steel industry. Averse as we are to picking up a newspaper sensation, we felt, nevertheless, that information of this sort would be of use to those interested in metals. We took it upon ourselves, therefore, to send out questions to a number of the leading metallurgists, foundrymen and platers asking them what, in their opinion, were the books which had been of greatest assistance to them. The answers were interesting and, in may ways, enlightening. Needless to say, a large number of books were reported, but only a small number got considerable percentage of the total recommendation. The following lists will show, in order of their popularity, the books chosen by those who reported their choices.

METALLURGICAL AND FOUNDRY PRACTICE

METALLIC ALLOYS, by GULLIVER.
ALLOYS and THEIR INDUSTRIAL APPLICATIONS, by LAW.
ALLOYS, by SEXTON.
MIXED METALS, by HIORNS.
ALLOYS, BRASSES and BRONZES, by THURSTON.
METALLIC ALLOYS, by BRANNT.

It is only fair to state that in view of the fact that they have been so recently published, certain books have hardly had a fair chance to become so widely distributed as the older works. We believe, therefore, that the mere fact that they were mentioned at all entitles them to a place on this list. They are as follows:

A LIST OF ALLOYS, by CAMPBELL.
GUN METAL and BRASS FOUNDING, by the PRIMROSES.
METALS and THEIR ALLOYS, by VICKERS.

METALLOGRAPHY AND PHYSICAL METALLURGY

INTRODUCTION TO PHYSICAL METALLURGY, by ROSENHAIN.
METALLOGRAPHY, by DESCH.
METALLOGRAPHY, by HOYT.
PRINCIPLES of METALLOGRAPHY, by WILLIAMS.
PHYSICAL CHEMISTRY of METALS, by SCHENCK.

ANALYSIS OF METALS

TECHNICAL ANALYSIS of BRASS, by PRICE and MEADE.
ANALYSIS of COPPER, by HEATH.
ANALYTICAL CHEMISTRY QUANTITATIVE, by TREADWELL & HALL.
STANDARD METHODS of CHEMICAL ANALYSIS, by SCOTT.
ELECTRO-ANALYSIS, by SMITH.
ANALYSIS of NON-FERROUS ALLOYS, by IBBOTSON & AITCHISON.

CRUCIBLE STANDARDIZATION

Elsewhere in this issue will be found a report from the Plumbago Crucible Association, describing the standarization of their crucible sizes. This fact is of sufficient importance to warrant a backward glance over the crucible business in the past.

In February, 1904, THE METAL INDUSTRY published an editorial commenting on the dissatisfaction among the large users of crucibles because of the difference in contents of crucibles which were supposed to be the same size but were made by different manufacturers. In one particular instance it is stated that the difference between the largest and smallest number 60 crucible made was almost 40 pounds of metal. It was recommended that the crucible makers convene and decide upon standard sizes to be used by all. Shortly afterwards a number of crucible makers signified their willingness to attend at a conference.

So far as we know, this is the first published statement of the difficulties peculiar to this trade. It seems, therefore, that from this germ grew the adoption of the standards recently made up by the Plumbago Crucible Association. From 1904 to 1923 is a long stretch but it must be remembered, however, that conditions during these nineteen years, both domestic and foreign, made such co-operation necessarily a difficult matter. It is sufficient to state that the achievement of standardizing crucible sizes by the industry as a whole is more than welcome. It will be appreciated not only by the manufacturers of crucibles but by the users who will know the capacity of the crucibles they are buying and be able to replace them from any source at short notice. The Plumbago Crucible Association is to be commended for its long step in the direction of true progress.

BUSINESS CYCLES AND UNEMPLOYMENT

A pamphlet has been issued by the Department of Commerce entitled "Business Cycles and Unemployment," which embodies the report and recommendations of a committee of the President's conference on unemployment. It will be remembered that in September, 1921, a conference on unemployment was held in Washington to devise ways and means for the relief of the four or five million unemployed at that time. Unprepared as this conference was for any such emergency, it could hardly do much at the time, but a committee was appointed by Secretary Hoover to undertake an investigation and report on methods of controlling the extremes of business cycles so as to lessen the losses due to recurrent periods of unemployment.

The recommendations which have been proposed by the committee to control the business cycle are as follows:

1. Collection of fundamental data.
2. Larger statistical service.
3. Research.
4. Control credit expansion by banks.
5. Possible control of inflation by the Federal Reserve System.
6. Control by business men over own industries.
7. Control of private and public construction at the peak.
8. Public utilities.
9. Unemployment of the reserve funds.
10. Employment bureaus.

The method of attack of the committee was such as to include not only the immediate problem of unemployment, but the basic causes of such a condition. It is now common knowledge among business men that in order to be successfully prepared against fluctuations in business, it is necessary to have "fundamental data" on such points as production, stocks, orders, consumption, employment, etc., throughout an entire industry and also its affiliated trades. Such data can be collected only with the willing co-operation of each individual in the industry, who is, incidentally, guaranteed the secrecy of his private report and at the same time helped by the collective effort. Trade associations are of tremendous assistance, but the work is hampered by a minority of individual companies which refuse to co-operate.

The committee recommends "the expansion and standardization of the statistics now collected by State and Federal bureaus, the publication of employment statistics by the Federal Bureau of Labor Statistics, and the final summation and publication of all of these statistics by the Department of Commerce, in order that there may be promptly available a connected, uniform series of facts about the trend of business."

Among the industries for which this statistical service was recommended were zinc, lead and copper, and the leading products of each. The dissemination of research information was also recommended and it was stated that the business fraternity should recognize the value of such work.

Much responsibility was placed on the banks. It was stated that they should guide the business man, discouraging him from over-expansion or from too heavy borrowing. A liberal policy was urged in periods of falling prices, namely, that individual banks which had borrowed from the Federal reserve in order to maintain their business while their own funds were tied up, should avoid pressing debtors for the re-payment of their own loans to such an extent as to throw business into too sudden decline (which in the past resulted in many cases of complete liquidation).

The Federal reserve system was pointed out as capable of exercising control over inflation by the proper uses of its gold reserves and its powers of granting credit. Moreover, the business man himself is not at all without responsibility in this matter. He should make every effort to retain his sense of proportion and to keep his business fundamentally sound by planning ahead for possible difficulties.

Private and public construction work can be used as a leveler of business changes. When business is at its peak, the Government should refrain from instituting any constructive work which can be put off. Private enterprises should follow the same plan. This work can be pushed at such time as other industries have declined, and thereby keep business from sinking into a trough. The same principle is recommended to public utility managements.

For the wage earner is recommended reserve funds for unemployment from savings during periods of prosperity, and the contributions to these funds by both employee and employer. It establishes, in a sense, an unemployment insurance fund. Unemployment bureaus nationally organized are recommended strongly, not as anything which can effect the business cycle, but to ameliorate conditions during a difficult period.

The report is the result of a really worth while investigation by a committee and its assistants, thoroughly competent to undertake it. Its recommendations must appeal to thoughtful business men. The point now, however, is not a discussion of its recommendations, since with these very few can quarrel, but rather the devising of means for putting them into effect.

CORRESPONDENCE and DISCUSSION

Although we cordially invite criticisms and expressions of opinion in these columns, THE METAL INDUSTRY assumes no responsibility for statements made therein

Impressions of the Convention of the American Foundrymen's Association at Cleveland, Ohio

To the Editor of THE METAL INDUSTRY:

The writer feels impelled to set forth a few thoughts bearing on the gathering of foundrymen and others allied to this great industry.

Taken in order the first impression had to do with the accommodation accorded the great influx of visitors to Cleveland. The hotels may take unto themselves no small amount of credit for the splendid handling of their guests. Complaints of this feature of the gathering were conspicuous by their absence.

Cleveland hospitality has undoubtedly established itself in the minds of all the visitors.

The many industries opened their doors for all who desired to inspect the plants, and every opportunity was accorded visitors to observe the methods employed by foundries and machine manufacturers. The open minded exchange of ideas was an inspiration and an index of the spirit of the times.

The public Auditorium which housed the Exhibition was a revelation to many. In area it covers almost an entire city block. Its every appointment might be said to be ideal for the display which was housed there.

In the basement were located the machinery exhibits. Here could be found molding machines, core machines, sand handling equipment, mechanical die sinking machines, compressors, and a variety of other devices in the words of the auctioneer, "too numerous to mention."

On the main floor the metal and supply exhibitors held forth. The foundryman found here everything needed in the foundry that was not in evidence on the floor below.

Those who did not attend this great gathering missed an opportunity of meeting, almost at one time, the best talent in the industry. It was a privilege and an education to come into friendly contact with the men who are the recognized leaders in metallurgical activities. The impression was carried away by many that this was the best convention yet held by the association.

Anyone who went to the convention as a non-member must have felt an almost irresistible desire to sign an application blank before leaving.

The ladies were entertained in a manner that will make it difficult for a foundryman to get to another convention without his wife. This feature of our gathering exemplifies the hospitality of the middle west.

As many points of interest were visited as the time permitted. Only words of appreciation were heard from lady visitors.

In conclusion, it seems that the feeling of all the visitors to Cleveland on this occasion could be aptly expressed by the phrase "A pleasant time was had by all."

WM. E. PAULSEN,
Secretary, Metropolitan Brass Founders' Association.

New York, May 12, 1923.

CORRECTION TO "PLATERS' WRINKLES"

To the Editor of THE METAL INDUSTRY:

Kindly allow me to call your attention to a typographical error in "Platers' Wrinkles," in order that it may be better in the next issue to that extent. On page 28 of "Platers' Wrinkles" the formula for sulphurous acid is given with the name sulphuric before it. Let me add that I enjoy this little pamphlet immensely, and it is always with me in the plating plant.

JAS. E. AULD.

Miami, Fla., May 3, 1923.

Technical Publications

CENTRIFUGAL CASTINGS

BY LEON CAMMEN

While this booklet was written primarily with a view to discussing the New Era in the Steel Industry, a few words are said of the application of centrifugal casting to other fields such as brass and bronze.

These are very important, as the new process makes it possible to produce tubes and plates from materials from which they could not be made by the usual processes, or could be made only at an excessive cost. Thus, monel metal seamless tubes have been successfully produced both by Leon Cammen, and, experimentally, the International Nickel Company. Manganese steel tubing has also been produced for the first time.

THE PREPARATION OF PLATINUM AND OF PLATINUM-RHODIUM ALLOY FOR THERMOCOUPLES†

By ROBERT P. NEVILLE.*

The Bureau of Standards has prepared in its laboratories thermo-element platinum and platinum-rhodium alloy for standard thermo-couples, to determine what performance might justly be required of such instruments. Melting of the pure metal and of the alloy was carried out in an Ajax-Northrup high frequency induction furnace, in crucibles of lime or thoria. Platinum and platinum-rhodium alloy, superior in quality to the best material of this kind formerly in the possession of the Bureau, was prepared.

ELECTROPLATERS' MANUAL

A loose-leaf booklet issued by the New York Branch of the American Electro Platers' Society contains standard information, tables, methods of analysis, etc., which are of constant use to the plater. The matter is presented in compact form for easy reference and is so made up that additions can readily be made as required.

RECLAIMING SAND*

BY F. L. WOLF AND A. A. GRUBB

The authors presented a preliminary report on the reclamation of worn out and burned brass molding sand. No conclusions were reached, but it seemed likely that sand high in bonding material might be added to spent sand with good results.

NOTES ON THE DEPOSITION OF IRON†

BY HARRIS D. HINELINE

Experiments were carried out to determine the type of plating bath that would give good deposits of iron on rubber. Particular attention was given to baths of high "throwing" power. Various formulas were tried out. A saturated bath of ferrous and calcium chlorides, containing chromous chloride and hydroquinone as reducing agents, gave the best results. Further investigation is encouraged.

*A paper read at the Cleveland meeting of the American Foundrymen's Association, April 28-May 3, 1923.

†A paper presented at the Forty-third general meeting of the American Electro-chemical Society, held in New York City, May 3, 4 and 5, 1923.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

BLUE PATINA

Q.—What can I use to get a blue patina color on bronze plaques and medals?

A.—The following solution can be used to get a blue patina color on bronze plaques and medals:

Water	1 gallon
Sulphate of copper	8 ounces
Sal ammoniac	8 "
Common salt	4 "
Chloride of zinc	1 "
Acetate acid 28%	2 "
Glycerine	1 "

Mix in boiling water. Apply cold by immersion or brush. Repeat as desired to obtain color.

Water	1 gallon
Copper sulphate	8 ounces
Sal ammoniac	6 "
Acetic acid	2½ "
White vinegar	6 "
Granular rock salt	6 "

Mix as above and use the same.

If the verde or patina is not blue enough, then the use of a little carbonate of ammonia added to the formula may accomplish this.—C. H. P. Problem 3,201.

BRIGHT DIP FOR ALUMINUM

Q.—Will you kindly let us know what is considered the best material to use as a dip to brighten up aluminum after it has become black from cutting down tumbling operation, and oblige?

A.—If you desire to produce a dead white or satin finish upon aluminum parts that have become black from cutting down tumbling operations, it will be advisable to acid dip them in a mixture consisting of

Sulphuric acid 66°	1 gallon
Nitric acid 38°	2 gallons

The aluminum articles should be free from grease, etc. Dip in the acid dip for a moment or two, then wash and dry out as usual.

If acid dipping is to be avoided then try wet tumbling, using

Water	1 gallon
Whale oil soap	1 to 2 ounces

Or, dry tumbling, using equal parts of maple sawdust and kid leather clippings with a polishing medium of precipitated carbonate of lime. This could be mixed with a little kerosene and gasoline as the lubricating medium. One or the other medium should answer the purpose.—C. H. P. Problem 3,202.

CASTING GOLD

Q.—In our gold filled tubing we sometimes are bothered with pits, and thinking this may be due to the melting of the gold, I would like your opinion. Our gold melts average 600 oz., size of ingot about 7½" x 14" x 1", poured full. Melted under a layer of charcoal, cleaned with a small lump of sal ammoniac, about a tablespoon of salt and poured after a brisk stirring. As the pits seem to come in spells we laid it to the melting of the gold. We roll the gold from 1" to ½", anneal and scalp, and we also anneal if just before soldering to the brass to see if there are any blisters.

Thinking that you might know of some oxidizing agent or flux to add I am writing to you.

A.—In casting about in our minds for the cause of your trouble with pitting in your 600 oz. gold bars, we think of three causes, anyone of which may make this trouble. We advise using only highly refined gold bars of 999 fineness or better, and electrolytic copper, having a purity of 99.90 or better. Pulverized charcoal or powdered alum should be used. No flux is necessary. Do not pour a vertical stream in your mold. This drop of 14 inches (length of ingot) is too great. Incline mold and flow the molten metal down the incline. Heat your mold to 400° F. or higher and use a good layer of lard or lard oil for greasing. If your fuel gives you an oxidizing flame, cover your crucible so it will not play upon metal.—H. D. C. Problem 3,203.

CASTING SILVER

Q.—I am experimenting with silver castings and find trouble in getting the silver to melt. Am using old sterling spoons and forks for this purpose and a small No. 1 Gautier crucible. The fuel is charcoal, and I use a hand bellows to get draft. These castings are small parts of a surgical instrument, and I was wondering if there was any other metal or alloy which I could use in place of silver and which would be easier to melt and yet would be a metal which would not corrode as with brass, copper or iron. I tried tin, but it is too soft and bends too easy. If you can offer me any suggestions as to the heat required in melting silver, how to purify it before pouring, or other suggestions in securing clean, smooth castings, will much appreciate same. Also any other substitute metal which would be easily melted.

A.—If you are using sterling silver articles and are having trouble melting same, it is presumably a question of lack of sufficient temperature. Sterling silver is not a high temperature alloy, but we are afraid your hand blast outfit is not producing the temperature sought. This alloy should be poured at about 930° C. If you are oxidizing this alloy, rendering it the more difficult to melt by your treatment, we should advise cutting up the silver alloy into small pieces covering same in crucible with ample granulated charcoal (fine) and putting on lid. With sufficient heat a melt of 30 ozs. should be ready to pour in 20 minutes. Most substitutes for silver, provide a nickel alloy which we should not advise with your melting facilities.

An alloy by the name of Touiner, Leonard, is said to resemble silver closely and may be worth trying. Put 200 parts of tin in crucible; when melted add 64 parts of bell metal (80 Cu. 20 Sn) broken into small pieces. Add little at a time, stirring well with an iron rod. Finally add 300 parts more of tin, stir well and cast.—H. D. C. Problem 3,204.

CASTING PHOSPHORUS MIXTURES

Q.—We are pouring an alloy consisting of the following materials: 12 per cent lead, 5 per cent of (10 per cent phosphor copper) 8 per cent tin, 75 per cent copper, for acid resisting purposes.

The phosphorus in this mixture causes it to combine with the molding sand and we have difficulty in making sound castings. Can you advise us how to overcome this trouble?

A.—We would suggest that you use a facing on the mold consisting of the following:

1 part pitch core compound
6 parts molding sand

For the core use a mixture of Bull Run talc and molasses water or a good grade of black lead and molasses water. When the core is dry take gasoline and mix with the Bull Run talc, or black lead to the consistency of a heavy paste, and rub the black and gasoline mixtures into the core until it shines. If done properly you will have no further trouble in making sound clean castings of a mixture of

78 copper
12 lead
8 tin
5 10% phosphor copper

W. J. R. Problem 3,205.

FLUX FOR THIN BRASS CASTINGS

Q.—We are making a line of very small, thin yellow brass castings which are polished and plated and which must be fairly stiff and at the same time bend without breaking.

We flux this metal with aluminum so that it will run very sharp, but the aluminum content gives us much trouble as it causes soft or dross spots in the castings which permits them to break, and we find it necessary to use phosphorus or some other flux to flow this metal so that we may secure a better result as to sound castings.

Kindly advise us what to use and how to use it, as we must get away from these dross spots.

A.—For brass castings such as you are making, no better flux can be introduced than aluminum where sharp, clear castings are desired, when properly handled. It is, however, necessary to eliminate lead when aluminum is introduced.

Aluminum is best introduced in the form of 10% aluminum bronze, that is, make a mixture of 90% copper and 10% aluminum and pour in ingots. For your class of work, use as follows: melt 53½% copper; add 41½% zinc and 5% aluminum bronze.

Get the copper good and hot and then add the zinc a little at a time, stir well and then add the aluminum bronze. In gating use a long run, and runner in the cope.

If best results are desired, no scrap should be used. However, clean sheet brass can be used and you must figure in the mixing that the clean sheet brass will contain approximately 62% copper and 38% zinc.—W. J. R. Problem 3,206.

MATCH PLATE METAL

Q.—We are making a line of very light yellow brass castings which are fitted up with 50 to 60 patterns to a gate; they run about two pounds to a gate and are made in a 12 x 18" steel flask.

We are about to put all of this work on cast match plates and we ask that you kindly advise us as to the best metal to cast these plates from, as this work must be held to size, also give us the probable source of supply for match plate metal and any information which you may have at hand on the casting of these plates.

A.—The best metal to cast match plates from is aluminum alloy of 92% aluminum and 8% copper. This metal can be had from any reliable smelter.

The metal, however, shrinks 3/16" to the foot. If your patterns will not stand for this shrinkage, the next best mixture to use consists of : 55% tin, 44% zinc and 1% bismuth. If this alloy is poured as cold as it is possible to pour very little shrinkage will be noticed. If the molder is careful in rapping the pattern you can just rub up the pattern. This mixture is known as white metal and has little shrinkage as has any other metal we know of for this line of work.

The white metal plates are heavy and not nearly so satisfactory as the aluminum plates. If you can stand the shrinkage, we recommend the aluminum match plates.—W. J. R. Problem 3,207.

MILK METAL

Q.—We had an inquiry from a concern for milk metal. The party amplified this specification by calling it "Nickelalloy."

It appears to us that this metal is used for castings in creameries, in which either the presence of lead or the necessity of plating or copper—so that it will not have any detrimental effects on milk products—is paramount.

A.—The mixture to which you refer is probably a nickel mixture of some special kind. We have no knowledge of the particular alloy to which you refer but can give you the following which will do the work:

Monel metal	40
Copper	44
Hardener	15
Manganese Titanium	1

Mixture for hardener:

Copper	30
Aluminum	10
Zinc	60

To make the hardener, melt the copper, add the aluminum, then the zinc and pour into ingots.

Another mixture which might do your work is as follows: Mixture No. 2.

Copper	45
Monel metal	50
Tin	1½ to 2½
Thirty per cent Manganese copper	2
Aluminum	½
Manganese titanium	1¼

When a hard metal is desired, use 2½% tin; when not quite so hard 1½%. It has been found by some of the larger dairy concerns that no other metal they have tried has proven so satisfactory for valves and fittings as this mixture. It is cheap, even though the first cost of casting comes high.—W. J. R. Problem 3,208.

POURING TEMPERATURES

Q.—Can you kindly advise us the pouring temperatures of some of the different Non-Ferrous Metals; also the analysis of berwyn bronze and the correct way to mix and melt same.

A.—The pouring temperatures of the different non-ferrous metals depend a great deal on the composition of the alloys. We would suggest to class them as high copper and tin alloy and high zinc alloy. The temperature is also governed by the class of work.

The approximate temperature to pour yellow metal, such as manganese bronze would be 1800 degrees F. For the high tin alloy, 10% and over, 2000 to 2100 degrees F. Copper tin and lead alloy, such as 80% copper, 10% tin and 10% lead, 1800 degrees F.

We have found it better practice to pour on the high side, although the class of work governs the temperature as a rule.

The mixture of berwyn bronze, we believe, is better known as Non-Gran. bearing bronze. The analysis of a sample of this metal, taken some time ago, consisted of:

Copper	85.90
Tin	11.74
Lead	none
Iron	none
Phosphor trace, Zinc	2.36

We would suggest a mixture be made of 50% nickel and 50% tin. Pour in ingots or shot. The mixture as it is easy to make weight, and make your mixture as follows: Copper 86%, Tin 9%, Nickel tin 2.50% and Zinc 2.50%. Use virgin metals. Melt the copper under charcoal and get the copper good and hot, add the nickel tin, stir well and add the balance of the tin a little at a time, stir well and let stand for 5 minutes and add the zinc. The metal is now ready to pour. If the first melt is poured in ingots and remelted before casting, better results are obtained.—W. J. R. Problem 3,209.

REPAIRING WOODEN TANK

Q.—We have a wood plating tank which has not been used for some time and which has dried out. We wish to put this in condition for plating use and beg to inquire the best method for doing so. We have been informed that by filling it with water and allowing it to swell up will temporarily fill it, but that the plating solution will again open it up.

As we do not wish to put a plating solution in the tank until it is tight, we are asking you for the above information. Thanking you for an early reply, either direct or through your columns, we beg to remain.

A.—If the wooden tank you desire to use again has no cracks in the wood, then all that is necessary to overcome the leaking that has resulted from non-use is to tighten up all nuts and bolts used in its construction first.

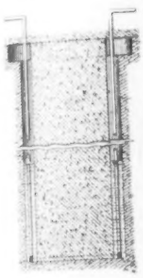
Then fill it up to the top with water, preferably hot water, or better still run live steam into the tank through a hose, if you have steam in your plant. The tank will swell sufficiently from the hot water and will not leak just as long as it contains a liquid solution.—C. H. P. Problem 3,210.

PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

1,444,891. February 13, 1923. **Method for Making Acid-Proof Alloys.** Richard Walter, Dusseldorf, Germany.

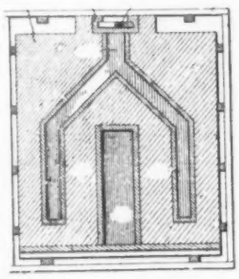
This invention relates to a method for obtaining acid-resisting alloys of silicon and a heavy metal or metals, and particularly of silicon and iron.



1,447,817. March 6, 1923. **Art of Casting metals.** James M. Perry, Detroit, Mich., assignor of two-thirds to himself and one-third to Horace G. Seitz, Detroit, Mich.

This invention relates to improvements in the art of casting metals, and pertains more particularly to methods designed to eliminate the presence of imperfections in the casting, such, for instance, as are usually caused by the presence of air or gas bubbles or holes produced by sand particles where the casting is made in sand molds.

1,447,795. March 6, 1923. **Enameling Oven.** Daniel Leissler, Chicago, Ill.



One of the primary objects of this invention is the provision of an oven of the character indicated which will be compact in structure and of reasonable cost in manufacture and which will produce and maintain a uniform temperature throughout the entire area of the oven so as to result in an even and uniform baking to produce a perfectly enameled and glazed article.

1,447,821. March 6, 1923. **Method and Apparatus for the Manufacture of Metal Tubes.** Eugene Schneider, Paris, France, assignor to Schneider & Cie, Paris, France.

According to this invention the liquid under pressure is admitted into a pocket made of sheet metal, brass, rubber or other deformable material; the external longitudinal surface of the pocket being in contact with the internal surface of the tube to be compressed, at the commencement of the operation. This closed pocket is provided at one end only with a duct for the admission of the liquid, and with a duct for the escape of air or the liquid. The pocket is deformed together with the tube to be compressed and thus transmits the pressure to the latter.

1,448,571. March 13, 1923. **Alloy.** Andrew O'Rourke, Chicago, Ill., assignor to Crane Company, Chicago, Ill.

An alloy, consisting of the following ingredients in substantially the proportions specified: Copper 50 to 65 per cent; zinc 8 to 20 per cent; nickel 10 to 25 per cent; lead 3 to 10 per cent; tin 1 to 5 per cent and antimony ½ to 2 per cent.

1,448,065. March 13, 1923. **Lacquering Machine.** Paul Harrich, Rochelle Park, N. J., assignor to New Process Cork Company, Brooklyn, N. Y.

This invention relates to lacquering machines, and more particularly to a type of such machine adapted to rapidly coat tin or other non-flexible sheets with lacquer, shellac, or other composition, and rapidly dry such sheets.

1,448,557. March 13, 1923. **Metal-Spinning Machine.** John Stanley Stull, Chicago, Ill., assignor to Western Electric Company, Inc., of New York, N. Y.

This invention relates to special tools and machinery and more particularly to devices for spinning metal tubes and the like and it has for its object to provide a simple, efficient and conveniently operable machine for spinning the shells or sleeves of the bases of electrical vacuum bulbs of any kind into the cap pieces, though the invention is adapted for wide use in this general capacity or other similar work.

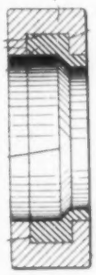
1,449,052. March 20, 1923. **Alloy.** Charles Pack, New York, N. Y., assignor to Doehler Die Casting Company, Brooklyn, N. Y.

This invention relates to alloys and in particular to aluminum alloys suitable for die casting.

Nickel	3 to 6%
Copper	3 to 6%
Silicon	1.5 to 4%

Aluminum not less than 85%.

1,449,053. March 20, 1923. **Method of Making Die Castings.** Charles Pack, of New York, N. Y., assignor to Doehler Die Casting Company, Brooklyn, N. Y.



In accordance with this invention, a core is provided of machinable material approximately the size and shape of the cut which it is desired to form in the finished casting, the core being preferably somewhat smaller than the cut in size. A die casting is then formed about this core, and after the casting has become set, the core is removed together with a slight portion of the casting by a machining operation to form the desired finished casting.

1,449,154. March 20, 1923. **Alloy.** Calvin Spencer Videon, Tottenville, N. Y., assignor to the S. S. White Dental Manufacturing Company, a corporation of Pennsylvania.

It is found that by the introduction of a small amount of copper, the alloy formed of gold, palladium and platinum may be greatly stiffened and hardened, and that an alloy which embodies the most desirable characteristics may be composed of 49 per cent gold, 37 per cent palladium, 13.45 per cent platinum, and .55 per cent copper.

1,449,157. March 20, 1923. **Enameling Composition.** H. F. Willkie, Baltimore, Md., assignor to U. S. Industrial Alcohol Company, a corporation of West Virginia.

The object of this invention is especially to provide a composition with which an enameled surface may be produced by the application of a single coat, if desired, thus saving the labor and the cost that is incident to the application of the customary second coating. The enamel coating obtained by the use of the composition, although applied as a single coating, is comprised of a lower layer of a dense opaque character and an upper varnish-like layer which gives the coated surface a high gloss.

1,449,338. March 20, 1923. **Alloy and Process of Making the Same.** Frederick T. McCurdy, Kokomo, Ind., assignor to Haynes Stellite Company, Kokomo, Ind.

It is found that the properties of alloys containing cobalt and one or more chromium group metals may be much improved by the addition of tantalum. These new alloys may be produced by incorporating substantially pure tantalum into a molten bath containing the other metals, or by adding the tantalum previously alloyed with other metals which exercise no prejudicial effect on the final product. It is preferred, however, to apply the tantalum as oxid, either the naturally-occurring iron and manganese tantalities or the artificial pent-oxid being employed. The tantalum material may be added either before or after the fusion of the other constituents of the alloy.

1,449,388. March 27, 1923. **Paint and Varnish Removing Composition.** Ida A. Ferrell, Staunton, Ind.

This invention relates to a paint and varnish removing com-

position and the primary object of the same is to provide a composition which will be effective in removing all sorts of paint and varnish and particularly from wood surfaces without in the least modifying or discoloring such surfaces and without injury to the hands of the user.

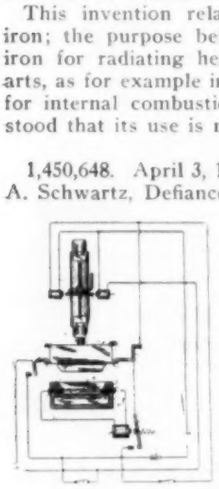
The composition embodies ingredients or constituents as follows:

Starch	24 oz.
Sodium carbonate	3 oz.
Sodium chloride	6 oz.
Sodium hydroxide	7 oz.

1,449,637. March 27, 1923. **Process of Welding Copper to Iron.** Guglielmo R. Tremolada, Detroit, Mich., assignor to Detroit Air Cooled Car Company, Detroit, Mich.

This invention relates to a process of fusing copper to iron; the purpose being to increase the conductivity of the iron for radiating heat, an object greatly desired in certain arts, as for example in the manufacture of air cooled cylinders for internal combustion engines—it will, however, be understood that its use is not to be confined to that art.

1,450,648. April 3, 1923. **Method of Forming Metal.** Harry A. Schwartz, Defiance, Ohio.



This invenion relates to an improved method of forging or forming metals, an object of the invention being to provide a method in which the part being formed, in itself functions as a circuit closing means to control the time of the forging or forming blow.

A further object is to provide a method of the character stated, in which the electric conductivity of the metal is utilized to control the time of the forging or forming blow.

1,450,699. April 3, 1923. **Process for Seamless-Tube Drawing.** Alonzo Clay Morse and Harry Richard Lewis, Jr., Shelby, Ohio.

This invention relates to an improvement in the process of seamless tube drawing wherein through a definite step of heat-treatment, the qualities and capabilities of the material for the specific purpose outlined, are materially increased.

1,448,571. March 13, 1923. **Alloy.** Andrew O'Rourke, Chicago, Ill., assignor to Crane Company, Chicago, Ill.

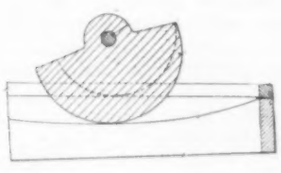
An alloy made in accordance with this invention is composed of metals in substantially the following proportions.

	Per Cent
Copper	50 to 65
Zinc	80 to 20
Nickel	10 to 25
Lead	3 to 10
Tin	1 to 5
Antimony	5 to 2
Iron	0 to 2

1,450,926. April 10, 1923. **Composition of Matter for Silver-plating Metals.** Lindolph Minor Sherow, Ossining, N. Y.

A composition of the class described containing silver nitrate camphor, a cyanide solution and whiting.

1,451,998. April 17, 1923. **Process of and Device for Drawing Bellied Objects of Sheet Metal.** Curt Neubauer, Mecklenburg, Germany.



A process for drawing bellied sheet metal articles, consecutive sections of which, in the drawing direction, differ in shape from one another, comprising the steps of drawing a metal sheet between a rotary drawing tool and a synchronously-moved coacting countermold, while imparting to the sheet a progressive forward bodily movement in the direction of its length and relative to the axis of the drawing tool, so as to cause said tool to act progressively upon the sheet from end to end thereof, and maintaining the distance between the tool axis and the plane of the mold constant during the entire movement of the sheet; substantially as described.

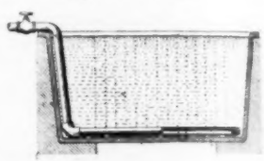
1,452,219. April 17, 1923. **Enamel Composition.** Adolph F. Pozdech, Newark, N. J.

A quick-drying enamel composition consisting of the following ingredients in substantially the proportions given: ground zinc white one-half pint, French varnish two ounces, benzine ten drops, lacquer one-half ounce.

1,452,281. April 17, 1923. **Metallizing Articles.** Quintin Marino, Hampstead, London, England.

A process of metallizing articles composed essentially of non-conductive ceramic ware, which comprises applying to the surface of the article, while such surface is substantially free from glaze, a solution of silver nitrate in an alcoholic solvent, allowing the alcohol to evaporate, applying to the surface a reducing agent containing the formic acid radical, brushing the surface of the article with a metallic brush, applying to the surface of the article, a warm solution containing silver cyanide, washing the article, and thereafter electro-depositing a metallic coating upon said article.

1,452,364. April 17, 1923. **Method of Purifying Molten Metal.** Walter T. Davis, Wheeling, W. Va., assignor to Wheeling Stamping Company, Wheeling, W. Va.

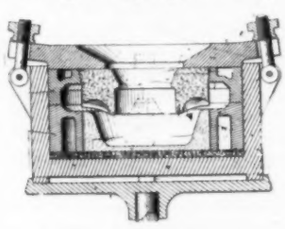


The herein described method of purifying tin or / and lead metal, which consists in liberating air at the lower portion of the mass of metal to be purified and causing said air to pass upwardly through the body of metal, substantially, as described.

1,451,755. April 17, 1923. **Method of Producing a Protective Coating on Objects of Magnesium or Magnesium Alloys.** Christian Bergh Backer, Bergen, Norway.

Method of producing a coating upon objects and materials of magnesium and magnesium alloys which comprises heating of the objects in the presence of water at a temperature of above 100° C.

1,452,480. April 17, 1923. **Apparatus for Casting Metals.** Nathaniel K. B. Patch, Buffalo, N. Y., assignor to Lumen Bearing Company, Buffalo, N. Y.



An apparatus for casting metals under the pressure of centrifugal force, comprising a rotatable head, and a molding flask mounted on said head to rotate therewith, said flask having a molding cavity in its upper portion and a comparatively deep well for molten metal in its lower portion communicating with said molding cavity.

1,452,573. April 24, 1923. **Electrodeposition of Tin.** Louis D. Simpkins, Brooklyn, N. Y., assignor to National Lead Company, New York, N. Y.

An electrolytic bath for depositing tin, containing a tin-salt solution and small amounts of beta-naphthol and a colloid.

1,452,750. April 24, 1923. **Readily-Fusible Alloy.** Arthur de Wolf Mulligan, London, England.

Fusible alloys melting between about 155° F. and 320° F. possessing strength, ductility and unaffected by weak acids or alkalies, comprising a mixture of between 0.8% and 2.5% of antimony, between 12% and 29.6% of tin, between 12% and 61% of lead, between 6.6% and 18% of cadmium and between 3% and 50% of bismuth.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

Vitreous Enameling with Electric Heat*

By E. F. COLLINS,

Consulting Engineer, Industrial Heating, General Electric Company

The enameling of metals is a relatively old art and had it beginnings prior to 1300 B. C., when the Assyrians and Egyptians used it in decorations for palaces and gifts. It has in the last few years developed into a modern industry of no mean size. The modern industry includes not only the manufacture of decorative materials but also the productions of enameled sheet steel and cast iron wares, considered as modern standards of durable and sanitary equipment in universal use.

Vitreous enamels are simply glasses with low melting points, fused to the surface of metals or anything which will withstand the fusion temperatures.

There are four general methods for applying the slip or enamel in preparation for baking it upon metal; first, slushing, or dipping the ware into the slip and the shaking it to give a uniform coat; second, dipping and then permitting to drain; third, spraying for complex shapes and even flat simple shapes; fourth, dusting or

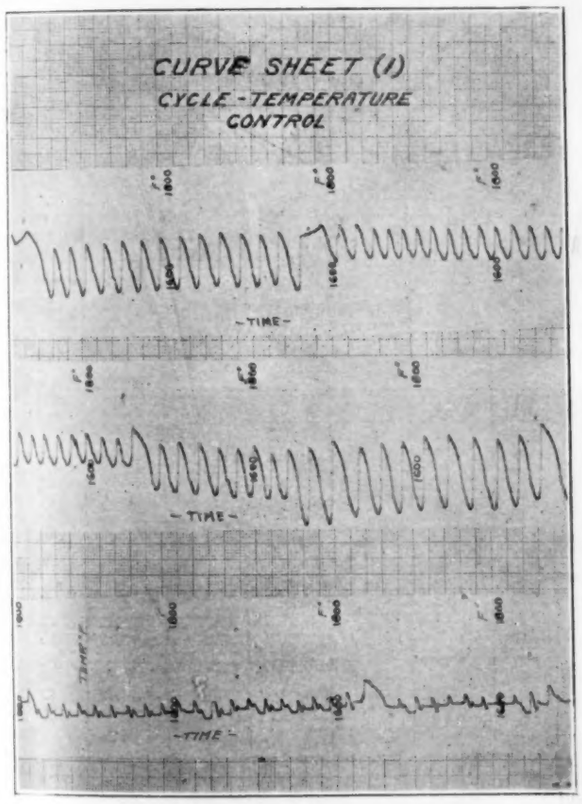


FIG. 1. PERFORMANCE CURVE SHEET

dry process, used generally on cast iron and heavy steel shapes. This process is used for bath tubs, sinks and similar ware.

Several types of furnace have been used in the past for the baking or burning of enamel ware. These differed mainly in the method of heating. When gas is used, a semi-muffled heating chamber may be employed, but when coal or fuel oil is used, then a full muffle is necessary.

One essential feature in the furnace is uniformity of temperature throughout the furnace, even though the flow of heat is decidedly different and varies in different parts of the baking chamber. Uniformity of temperature depends upon the type of furnace used and upon its design.

Within the past four or five years, the electric furnace has steadily and continuously demonstrated that it is without a peer when the results from its use in baking vitreous enamel are compared to fuel fired furnaces. In this type of furnace the control of heat flow is so complete that uniform temperature may be applied in baking a complex shape, even though the heat flow or heat quantity varies in different parts of the charge. I refer to such parts as apron bath tubs. Here no difficulty is met in delivering the required amount of heat at the same temperature on either the apron or reverse side of tub. Such manipulation of heat is, of course, impossible with other than the electric furnace.

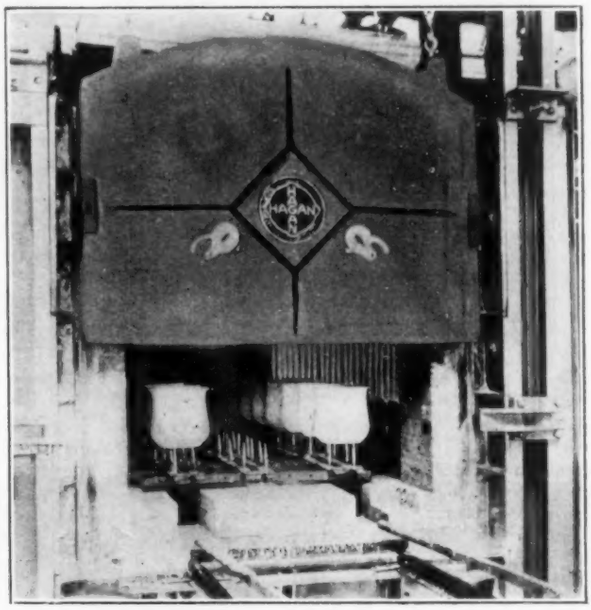


FIG. 2. BAKING LIGHT ENAMEL WARE

The metallic resistor type of electric furnace is the one with which this paper deals. Such furnaces are equipped with automatic control of temperature and operate at temperatures of 1900° F. or better, which cover the ordinary requirements of 1800° F. for ground coat, 1750° F. for first finish coat and 1600° F. for finish coats.

Due to the perfect heat control in these electric enameling furnaces, they show a greater output for the same furnace hearth than the fuel fired furnace.

The time of burning is dependent upon the cooler portions of the fuel furnace and a compromise must be made between hot and cold portions of furnace which may result in some parts of the charge being slightly under-fired and other parts being slightly over-fired. If the furnace has large variations, the ware must be turned.

Strictly speaking, to insure a uniform product, the furnace must be capable of maintaining a constant operating cycle of temperature when furnace is charged which again rises as the charge beworking of the furnace the temperature will vary from the maximum just before charging, followed by a sudden drop in temperature when furnace is charged which again rises as the charge becomes heated.

*From a paper read before the American Ceramic Society.

If this cycle of temperature can be made to occur regularly and identically, then the furnace has a controllable temperature suited to the work of vitreous enameling. Such performance is shown on curve sheet (1). This chart shows uniform cycles of temperature and for light and heavy work in the electric furnace.

In addition to temperature control, the electric furnace is possessed of a long life and low power consumption.

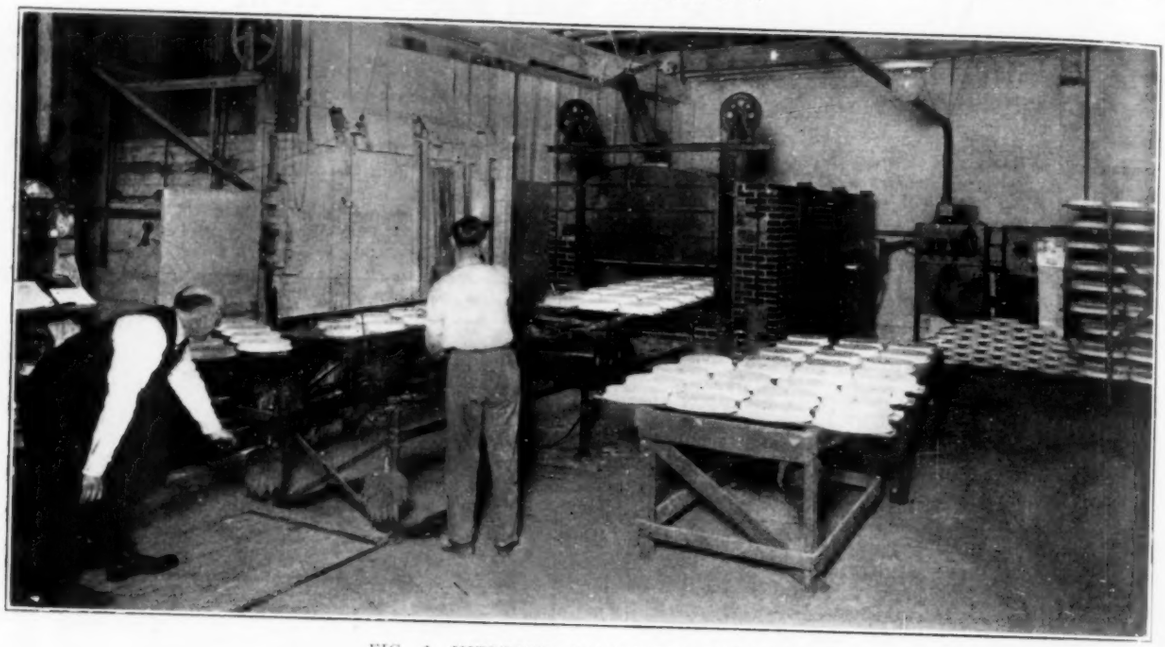


FIG. 3. VITREOUS ENAMELING FURNACE

Sulphur fumes which are injurious to enamel ware are absent in the electric furnace, and hence its use secures against high percentage of rejections from this cause.

Again the electric furnace has no muffles to give trouble, such as is experienced with coal and oil firing.

The electric furnace has been able to handle 170 heats in 10 hours as against 130 heats with the coal fired furnace. Heats have been completed in 50 seconds that would require 3 minutes and 40 seconds in the oil furnace of the ordinary type.

It is desired to call attention here to a few installations of the electric furnace for the baking of vitreous enamel. These furnaces range from one which is enameling watch dials to those handling the largest size of bath tubs, and they have shown to be uniformly satisfactory for all classes of work on which they have been used.

In Fig. 3 is shown a vitreous enameling furnace with baking chamber 10 ft. deep, 4 ft. wide, and 2 ft. high. This furnace has been operating something over two years and the users report that it is superior in many ways to the fuel fired furnace formerly used by them. They state that the "over-all" cost of product is less than for the fuel fired enameling furnace. The upkeep has been practically nothing compared to the cost of upkeep of coal or oil fired furnace doing the same duty.

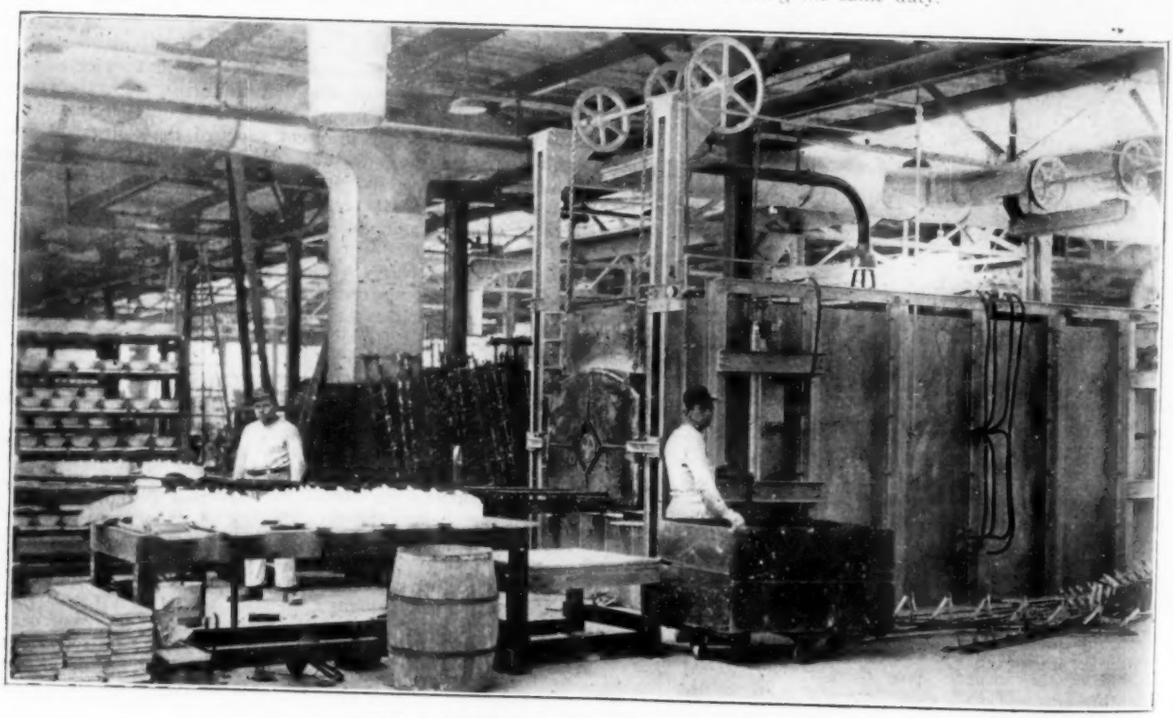


FIG. 4. BAKING DOMESTIC ENAMEL WARE

In Figures 2 and 4 are shown views of a furnace operating on enamel ware of the lighter domestic class. Here again the manufacturer using it speaks highly of its performance and states that its use gives a lower "over-all" cost for his product than did the coal or oil fired furnace. Better working conditions especially in hot weather are given by the user of this furnace as a great advantage.

The writer hopes that what he has said here will encourage those who have not done so, to investigate the merits of the electric metallic resister furnace for vitreous enameling. He sincerely regrets that he is unable to present, at this time, more definite data regarding all installations recently installed as well as all those which have been operating for many months. Much data of this nature has, however, been rather jealously guarded by several who have used this type of furnace, for the reason, perhaps, that they are not anxious to have their competitors realize too soon the advantage they have secured for themselves through the use of the electric furnace.

POLISHING WHEELS

The Advance Wheel Manufacturing Company, Inc., 125 West Illinois street, Chicago, Ill., is putting out a line of polishing wheels that are made by a new method of interlocking two half layers. It is claimed that this method insures balance, uniform wear and long life to the bearings of the polishing lathe. These half layers are alternated with whole layers. The wheels are made of cullneck, sheepskin and canvas.

This company manufactures its wheels from a quarter to a half inch oversize, so that when the wheel is trimmed down by the polisher, it will be the actual size ordered by the customer. The customer gets exactly the size he orders, and no less.

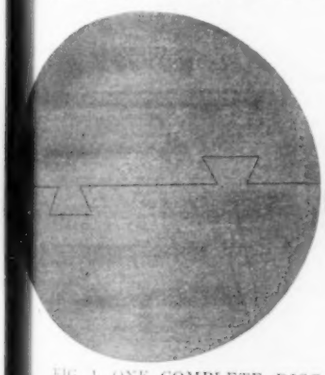


FIG. 1. ONE COMPLETE DISC.

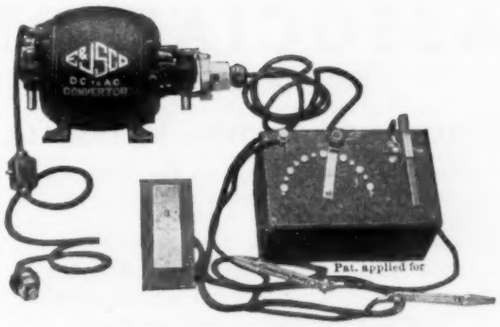
FIG. 2. FINISHED WHEEL

Fig. 1 shows one complete disc composed of two half layers securely and perfectly interlocker, thus producing a full size disc with the strength of a disc made of one piece of whole stock. Fig. 2 shows a finished polishing wheel ready to put on lathe.

ELECTRIC SOLDERING MACHINE

The E. & J. Swigart Company of Cincinnati, Ohio, jobbers and importers of jewelers' tools, material, supplies and optical goods, have placed an electric soldering machine upon the market which has, it is claimed, proved an innovation to the jewelry and optical trades in the way of soldering, doing away with the blow pipe. While it is still necessary to prepare articles to be soldered in the usual manner with soldering flux, etc., the act of soldering is accomplished almost instantly.

It is not necessary to heat the entire article as is customary with the blow pipe. The heat is applied directly to the spot desired, by applying the article to the carbon on machine or using a carbon point which is supplied with each outfit and apply heat to article. In this manner, jewelry with stones can be soldered without removing stones. Another difficult task is to solder nose pieces on shell spectacles. It is stated, however, that this can be accomplished with this machine. It is also being taken up by the dental trade which quite frequently is obliged to do some hard soldering, and sometimes in two places on one plate. It can be used for spot welding on small articles.



ELECTRIC SOLDERING MACHINE

It is made for alternating current, but can be used on direct current with the aid of a convertor, which is also supplied by this firm.

METAL FINISHING CHEMICALS

The American Chemical Paint Company has issued two bulletins (10 and 11-B) on Deoxidine and The Rustless Process of Soldering, Metal Finishing and Painting, respectively.

Bulletin 10 on Deoxidine gives a full description of the methods of preparing steel for painting with many valuable hints for the metal finisher. Bulletin 11-B describes a method of preventing rust, especially on soldered work to be painted. This concern also manufactures a number of other products, such as Flosol, a soldering acid; Deoxylyte, a rust preventative; Peroline, a rust preventative and remover; Remick, a heat resisting black paint; Lithoform, a priming coat for paint on galvanized (zinced) iron.

DIXON BOOTH AT THE CONVENTION

The illustration shows the booth of the Joseph Dixon Crucible Company, Jersey City, N. J., at the recent American Foundrymen's Convention in Cleveland. The group in the

DIXON BOOTH AT CLEVELAND CONVENTION

photo consists of Messrs. Belleville, Haasis, Leonard and Hewson, all Dixon Crucible salesmen. A. L. Haasis is the head of the Crucible Sales Department at Jersey City. Interesting exhibits of crucibles, etc., were shown, including several that had seen actual service.

CORRECTION

At the head of the article describing Mono-Line, a new refractory concrete lining put out by the Quigley Furnace Specialties Company, 26 Cortlandt street, New York, the title was given as "New Refractory Cement." This was an error. The title should have been "New Refractory Concrete Lining."

ASSOCIATIONS and SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

SOCIETY FOR TESTING MATERIALS

Headquarters, 1315 Spruce Street, Philadelphia, Pa.

The twenty-sixth annual meeting of the American Society for Testing Materials will be held in Atlantic City June 25-29, 1923. The part of the program devoted to metals is as follows:

First Session—Monday, June 25, 8 P. M.

ON NON-FERROUS METALS AND ALLOYS

Minutes of Twenty-fifth Annual Meeting.

Report of Committee B-1: On Copper Wire. J. A. Capp, chairman.

Progress Report.

Report of Committee B-2: On Non-Ferrous Metals and Alloys. William Campbell, chairman.

Presenting revisions in Tentative Specifications for Condenser Tubes. Recommending advancement to standard of Tentative Specifications for Brass and Copper Pipe, and Methods of Analysis for Nickel, Brass Ingots and Bronze Bearing Metal. Report of progress on study of proportions and methods of casting test specimens for castings. The committee hopes also to present brief papers describing the situation with respect to specifications for antimony and tin.

Methods of Casting Test Specimens of Gun Metal. E. H. Dix, Jr.

Includes results of a series of experiments performed to obtain a satisfactory method for casting test specimens of gun metal. From the results of these tests the author recommends a simple method of casting test specimens which will be easy to cast, require a small amount of metal, be easy to cut from the gates, require no machining, and which will give uniform and dependable results.

The Influence of the Ratio of Length to Diameter in Compression Testing of Babbitt Metals. J. R. Freeman, Jr.

Describes an investigation in which three series of compression tests were made on two representative white metal bearing alloys, a trypical tin base and a typical lead base alloy, in which the length of specimen was varied. The results of the tests showed that within the experimental error of the test methods, the unit of deformation of a babbitt metal in compression is independent of the ratio of length to diameter for specimens 1 in. in diameter and between 1 and 3 in. in length.

Report of Committee D-14: On Screen Wire Cloth. R. W. Woodward, chairman.

Presenting tentative specifications for non-ferrous screen wire cloth.

Report of Committee E-4: On Metallography. W. H. Bassett, chairman.

Reporting general progress, with reports on heat treatment and nomenclature. The committee is developing methods of metallographic testing of non-ferrous metals and alloys.

Announcement of Election of Officers.

Second Session—Tuesday, June 26, 9:30 A. M.

ON CORROSION, FATIGUE OF METALS AND MAGNETIC ANALYSIS

Report of Committee A-5: On Corrosion of Iron and Steel. J. H. Gibboney, chairman.

Report of further inspection of sheets in atmospheric corrosion tests and of sheets in total immersion corrosion tests. Submitting proposed methods of galvanizing sheet material and methods of testing.

Report of Committee B-3: On Corrosion of Non-Ferrous Metals and Alloys. E. C. Lathrop, chairman.

A report of progress in the collection of information on corrosion testing and a summary of the replies received to date to a questionnaire on the subject.

Endurance Properties of Steel: Their Relation to Other Physical Properties and to Chemical Composition. D. J. McAdam, Jr.

Consideration is given to the relationship of endurance properties to static tensile and torsion properties, relationship of endurance properties to impact properties, influence of chemical composition and heat treatment, influence of non-metallic inclusions, and influence of form and surface finish of a machinery part. Types of steel best adapted for various kinds of service are discussed.

Resistance of Manganese Bronze, Duralumin and Electron Metal to Alternating Stresses. R. R. Moore.

Gives the results of an investigation to determine the endurance limit of duralumin bar stock as rolled, annealed and tempered. Similar tests on manganese bronze and electron metal are reported. Evidence is offered to show that the endurance limit of non-ferrous metals cannot be determined by applying 10,000,000 repetitions of stress as is the case with most steels. Results of long time tests with 200 to 300 million repetitions of stress are included.

AMERICAN ELECTROCHEMICAL SOCIETY

Headquarters, Columbia University

New officers of the Electrodeposition Division for 1923-1924 are as follows: Chairman, S. Skowronski; vice-chairman, Charles A. Mann; secretary-treasurer, William Blum; members-at-large, M. R. Thompson, F. R. Pyne.

The new officers of the Society, as announced at the New York Meeting are as follows: President, A. T. Hinckley; vice-presidents, Lawrence Addicks, G. K. Elliott and Henry Howard; managers, F. M. Becket, C. B. Gibson and R. A. Witherspoon; treasurer, F. A. Lidbury; secretary, Colin G. Fink.

AMERICAN ZINC INSTITUTE

Headquarters, 27 Cedar Street, New York

At a meeting of the American Zinc Institute in St. Louis, Mo,. May 14-15, 1923, officers were elected and important policies adopted. The board of directors decided to spend $100,000 on a publicity and advertising campaign to develop the uses of zinc. This work will consist not of attempting new fields but of improving zinc products in the already tried fields. Efforts will be made to produce heavier coatings on galvanized and zinced iron, which will not conflict with the sheet zinc industry, but rather work together with it.

AMERICAN ELECTROPLATERS' SOCIETY

MONTREAL BRANCH

Headquarters, care of A. Giroux, 48 Craig, West

The election of officers of the Montreal branch took place as follows: J. T. Madden, president; Frank Green, vice-president; J. H. Seelay, secretary-treasurer; Andrè Girone, librarian; Romeo Chalut, Jack Shaw and J. A. Blascoll, board of management.

Under new business a discussion came up as to whether the Montreal Branch was in favor of holding the 1924 Convention in Montreal. It was moved by R. Chalut and seconded by E. B. Davidson that the delegates representing the Montreal Branch at the Convention in Providence do all in their power so that this honor be granted to them. The motion was adopted unanimously.

NEWARK BRANCH

Headquarters, care of Royal F. Clark, 71 Chadwick Avenue

The Newark Branch held its last regular meeting for the fiscal year on May 18, 1923, at 17 Central avenue, Newark, N. J. Twenty members and five visitors were present with President A. J. Sizelove in the chair. The roll of officers was then called, all found to be present (except Vice-President Carlson, who is out of town), and Trustees Sievering, Piske and Pflom.

Minutes of the last meeting were read and approved.

H. H. Smith gave a very interesting talk on securing a permanent meeting room and laboratory, suggesting that perhaps combined with the various scientific societies in Newark we could secure such a building.

Chas. H. Proctor, founder of the A. E. S., installed the following officers: Royal Clark, president; Roy Stout, vice-president. Librarians, E. W. Faint, George Ankson and Wm. Deroti. Sergt.-at-Arms, Dressel. Trustees, O. J. Sizelove, P. Sievering, H. H. Smith, Chas. Piske, A. Pflom. Secretary-Treasurer, George Reuter. In installing the officers, Mr. Proctor instructed each the duties of his office.

Mr. Proctor also spoke to A. J. Sizelove and to officers of the past year, in praise of the achievement and advancement made by the Newark Branch. Mr. Proctor proceeded to tell the members his dream of the future A. E. S. A large hall where members meet for the annual convention and to hold an exhibition of metal finishes. The society will stand out in all its glory with its desired end of co-operation and education of every member; every branch a link and the society the chain of unbroken links. No contention should ever exist except that noble contention of co-operation and helpfulness to each and every member. A rising vote of thanks was tendered Mr. Proctor for installing the officers.

The meeting was then turned over to Mr. Faint, librarian, by President Clark. S. Gickenhaus, a member of Newark Branch, read a very interesting paper on the Plating of Soft Metal Novelties, covering 25 years' plating experience in lead-antimony work, giving formulæ for each solution and instruction about how each was used; also the cleaning for different classes of work.

EXPOSITION OF CHEMICAL INDUSTRIES

Headquarters, Grand Central Palace, New York

In order to secure from the various companies who will exhibit at the Ninth National Exposition of Chemical Industries which will be held at the Grand Central Palace, New York, during the week of September 17 to 22, inclusive, the industries which they are most desirous of reaching through their exhibits, a questionnaire has been sent out by the Exposition management. Based on the expressions of opinion by the majority of exhibitors, the final plans for the 1923 Exposition will be laid. According to types of visitors most desired, appeals will be sent out to these industries and particular emphasis will be laid on features of the program designed to attract them to the Exposition. By deliberately planning the appeal to interest along well defined channels, the management of the Exposition expects to bring materially larger proportions of the buying power of the chemical and equipment consuming industries than in previous years.

The Advisory Committee which aided in conducting last year's Exposition, has been expanded, and in addition to the former twenty executives and technical men, now includes, among others, the following members from the sales and production departments of the chemical and chemical equipment manufacturers: Dr. Charles L. Reese, of E. I. duPont de Nemours & Company; Milton Kutz, of the Roessler & Hasslacher Chemical Company; W. E. Moore, of the New Jersey Zinc Company.

Personals

On May 1, 1923, after sixty-three years of service, **Thomas Aspinwall** was pensioned and retired by E. A. Williams & Son, Inc., 105 Plymouth street, Jersey City, N. J. He came to work for William Williams, the founder of the company, in 1860, and under him learned the trade of moulding, eventually becoming one of the most expert and skilled men in his line in the country.

During the early years of his connection with the above company he either made himself, or supervised the making of many castings of exceptional historic interest, such as bronze gun parts for the earlier type of breech loading field pieces and many other ordnance castings which were produced by E. A. Williams & Son, Inc., during the Civil War. In connection with the Civil War it is of interest to note that Mr. Aspinwall also worked on bronze parts for the "Monitor" and the Stevens Floating Battery, both of which vessels were built for the U. S. Government in yards near their foundry.

When aluminum was first discovered and considered suitable for commercial castings, he personally supervised the making of some of the first aluminum castings made commercially in this country. Later he produced castings of aluminum for several of the cup defending yachts, and also for the "Holland" (the first practical submarine ever built).

THOMAS ASPINWALL

In 1872 he became superintendent of E. A. Williams & Son, in which capacity he worked until 1906 when he was relieved from this duty and placed in charge of their pattern department where the work was less exacting and consequently more suitable to his advancing years. In this capacity he worked up to the present date.

"Old Tom" as he is affectionately known throughout the organization and also to many hundred customers as well, is at the present time hale and hearty, and it is hoped that he will live many years to enjoy the quiet and comfort of the little farm in Northern New Jersey to which he has retired. It is a great pleasure for the officers of E. A. Williams & Son, Inc., at this time to express their appreciation publicly of the many years of faithful service of Mr. Aspinwall, and to state that much of the high reputation that the company enjoys for the excellence of its castings is due to the careful training that many of the present employes received from him during the years when his was the controlling hand in the production department of the company.

E. H. Dix, Jr., who has been in charge of the metals branch at McCook field, has accepted a position which will place him in charge of the new metallurgical laboratory in the research bureau of the Aluminum Company of America, New Kensington, Pa. Mr. Dix's work at the local field has been almost entirely devoted to research in connection with light alloys and foundry work.

C. A. Rose, previously connected with Guggenheim Bros., in an important capacity, has been appointed general manager of the British America Nickel Corporation, Ltd., with offices at Ottawa, Canada. Operations will begin at 100% capacity immediately.

L. R. Nourie has joined the Thomas Spacing Machine Company, Pittsburgh, Pa., and will have charge of sales in that district. He was formerly with the Pittsburgh office of Manning, Maxwell and Moore.

A. L. Seaman, 549 West Washington Boulevard, Chicago, has been appointed sales representative in Chicago territory for the Wolverine Tube Company, Detroit, Mich., manufacturer of seamless brass, bronze and copper tubing.

Bradley Stoughton, inventor of furnaces used in metal plants, writer on metallurgy and engineering, until recently secretary of the American Institute of Mining and Metallurgical Engineers and a prominent New York consulting engineer, has been appointed professor of metallurgy at Lehigh University and has accepted. Mr. Stoughton will take up his duties at the beginning of the next college year.

E. Ross Millring has joined the staff of Lucius Pitkin, Inc., 47 Fulton street, New York, in the capacity of chemist and metallurgist. Mr. Millring was at one time in the Research Department of the Western Electric Company, and consulting chemist and metallurgist for Kastenhuber & Lehrfeld, platinum refiners.

E. ROSS MILLRING

Earl W. Cannell, who has been with The Osborn Manufacturing Company for the past seventeen years, has been made purchasing agent effective June 1, 1923. Prior to taking over this department, Mr. Cannell had charge of the sales development department and previous to that time was on the road. W. E. Mitchel, who has been Purchasing Agent for the past eight years, has resigned to go into business for himself.

John D. Willard will direct a new company, the Occidental Plating Works, 418 Hobart Building, Oakland, Cal., which has just been granted a charter with a capital of $20,000 to open business.

Victor Zachert and **David Isaacs** will conduct the **Royal Metal Recovery Works** at 310 California street, Oakland, Cal.

G. Hicks, of the **Oakland Retinning Works,** Oakland, Cal., has taken M. A. Wright into the business as a partner. The business has been long established at 106 Adeline street.

H. R. Sargent, formerly manager of the Wiring Supplies Division of the Bridgeport Works of the General Electric Company, has been appointed Managing Engineer of this division under a development plan which will create several unit divisions at the Bridgeport factory.

Dr. George K. Burgess, chief of the Division of Metallurgy, Bureau of Standards, well known in the metal and allied industries, was appointed by President Harding as director of the bureau, succeeding Dr. S. W. Stratton. Dr. Burgess has been associated with the bureau since 1903 and is recognized as being well qualified for his new position because of his extensive understanding in the field of sciences and his intensive research work. The new director of the bureau was born in Newton, Mass., in 1874 and graduated from the Massachusetts Institute of Technology in 1896. In 1903 he went to Washington and entered the Bureau of Standards, where he was placed in charge of pyrometry. Out of this grew the Division of Metallurgy, which was established in 1913, with Dr. Burgess in charge and the only man in the division, which now has a personnel of 53.

Dr. Richard B. Moore, chief chemist of the Bureau of Mines, Department of the Interior, has resigned his post to take effect June 1. Dr. Moore will be succeeded by Dr. Samuel C. Lind, who has for some years acted as a superintendent of the Rare and Precious Metals Experiment Station of the bureau at Reno, Nevada. Dr. Moore will enter the commercial field with the Dorr Company, New York.

Deaths

PROF. HANS GOLDSCHMIDT

Prof. Hans Goldschmidt, inventor of the widely known Thermit Process for welding iron and steel and for producing high grade metals and alloys, also originator of many other scientific inventions, died suddenly in Baden-Baden, Germany, on May 20, 1923, after a stroke.

Prof. Goldschmidt was born in Berlin, Germany, on January 18, 1861. His father was the proprietor of chemical works and tin smelters which he had founded in 1847. After having been graduated from the "gymnasium" of Altenburg, Hans Goldschmidt studied chemistry, physics and natural sciences in general at the universities of Berlin, Leipzig, Heidelberg, Strassburg and at the Institute of Technology at Charlottenburg, his principal teachers being A. W. Hoffman, Landolt, Wiedemann, Bunsen, Kundt and Slaby. He received the degree of Ph.D. from the University of Heidelberg in 1886.

In 1887 Prof. Goldschmidt entered the firm of Th. Goldschmidt, Essen, Ruhr, Germany, in joint partnership with his brother, Dr. Karl Goldschmidt. The attention of the latter was applied mainly to the business management of the company, while Prof. Hans Goldschmidt devoted himself to scientific research.

Prof. Goldschmidt's most important invention was the Thermit Process, now used extensively all over the world for welding iron and steel sections, and for producing metals and alloys of high purity.

Prof. Goldschmidt visited this country very frequently and was president of the Goldschmidt Thermit Company, now Metal & Thermit Corporation, from 1904 to 1916. Through his death the world loses a chemist of great knowledge and inventive genius.

EDWARD TOWNSEND SCHOONMAKER

Edward Townsend Schoonmaker, an artist and designer in brass and iron and for several years connected with the firm of J. B. Sargent & Co., of New Haven and New York, died in his seventy-third year, May 26, 1923, at his home in South Orange, N. J. Mr. Schoonmaker was a student in art, science and chemistry, and bore a reputation second to none in his line of work. Some of his artistic work can be recognized in the outside door of Gorham & Co. in Fifth avenue, the hat rack at the Waldorf-Astoria Hotel, and the lanterns on the steps of the residence of the ex-Mayor Seth Low. He is survived by three sons, Covel, Wilbur and Eugene Schoonmaker.

GUSTAV ADOLF BOEDDICKER

One who has played a considerable part in the metallurgical activities of Birmingham has just passed away in the person of Gustav Adolf Boeddicker, managing director of Henry Wiggin & Company, Ltd., a well known metal rolling firm which a year or two ago was amalgamated with the Mond Nickel Company. Mr. Boeddicker was born in 1850 at Iserlohn, Westphalia, and received his chemical and metallurgical training at the Berlin Technical College (now the Charlottenburg College) and at the Royal School of Mines, Berlin. He was subsequently appointed demonstrator and principal assistant to Dr. Finkener, the head of the college, who was, in his day the leading European authority on inorganic chemistry. Later appointments were those of chemist to the Iserlohn Nickel Works, and assistant manager of the Imperial Mint at Berlin. In 1877 he came to Birmingham to become chemist to Wiggin and Company and under his direction were carried out a number of important developments in the processes of the drawing of nickel steel and German silver, the manufacture of cobalt salts and tin oxide, in addition to valuable electrical research. Mr. Boeddicker was one of the founders of the Institute of Metals.

MARK W. RAY

Mark W. Ray, whose death on February 14, 1923, was reported briefly in our May issue, was the vice-president and one of the original organizers of the Lava Crucible Company of Pittsburgh. Mr. Ray was born at Indiana, Pa., March 20, 1873. With the organization of the Lava Crucible Company, of Pittsburgh, during the War, he became intensely interested and devoted a great deal of time to the development of this company and served as its vice-president and director from its beginning. He was also a member of the Chamber of Commerce and Pittsburgh Credit Men's Association and his passing leaves behind it sorrow among a large coterie of friends and business associates.

L. O. KOVEN

L. O. Koven, senior partner in the firm of L. O. Koven & Brother, Jersey City, N. J., and vice-president and treasurer of the Hoevel Manufacturing Corporation, died May 17, 1923, in his 63rd year.

ERNEST TRUDEAU

The Montreal Branch of the American Electro-Platers' Society announces the death of Ernest Trudeau, foreman plater of Caron Brothers in Montreal, on April 26, 1923, at the age of 46 years. He was one of the founders of the Montreal Branch, and was with the above firm for twenty years.

JOHN P. EUSTIS

While returning from a theater in New York, John P. Eustic died suddenly, April 6, aged 65 years. He was founder and treasurer of the J. P. Eustis Manufacturing Company, Cambridge, Mass., brass founders.

H. S. WYCKOFF

H. S. Wyckoff died on April 5, 1923, at the age of 48. He was with Harshaw, Fuller & Goodwin, Cleveland, Ohio, as salesman in New England, New York and northern New Jersey. He was well known throughout the industry.

NEWS OF THE INDUSTRY

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

WATERBURY, CONN.

JUNE 1, 1923.

Waterbury manufacturers as well as most manufacturers along the Naugatuck Valley have been much interested in the bill before this session of the General Assembly forbidding the pollution of streams or tidal waters by sewage or other wastes. **John H. Goss,** of the **Scovill Manufacturing Company** was one of a commission appointed two years ago to investigate the pollution of the waters of the state. The commission reported this year, recommending the appointment of a permanent commission to regulate stream pollution, with power to order any factory, individual or city, after a hearing had been held, to chemically treat all wastes emptied into any stream. Practically all the factories in Waterbury and cities and factories along the Valley empty their wastes into the Naugatuck river and would be consequently affected.

This commission's bill was not drastic enough, however, to suit many of the anti-pollution advocates and a substitute was drafted so drastic that it would have put many factories out of business, as it allowed for no hearings nor for any exemptions from the orders of the commission because of any peculiar situation of a factory and provided also that the commission could take out injunctions to enforce its orders. It also provided that only one of the commission should be a manufacturer and the others physiologists, farmers and shellfishermen. In all more than 7 substitute bills and amendments were offered and after a vigorous battle, the moderate bill recommended by the commission passed the Senate but is still held up in the House.

As finally passed by the Senate it provides for continuing the commission which made the investigation as the administrative commission to carry out the terms of the bill. This means that **John H. Goss** of **Scovill's** and City Engineer **R. A. Cairns** of this city will continue on the commission and as the rest are mostly manufacturers it is presumed that the law will not be enforced so as to damage greatly any of the local factories. The House, however, is opposed to this moderate bill and wants to amend it, making it more drastic, putting a different commission in charge but as the Senate is not expected to recede from its position the only result will be that the whole bill will die.

The **American Brass Company** has imported from 50 to 100 "Southern whites" for common labor in its local plants. They are engaged through the New York office and are paid at the rate of 40 cents an hour. This is the first time that "Southern whites" in any number have been brought to the city to help solve the employment situation. While a few months ago jobs were scarce, now it is hard to find men to fill them. Other factories are employing Portuguese labor which was so common during the war and still others have brought down large numbers of "lumberjacks" from Maine.

Already the factories are again utilizing the rooming house barracks built during the war for this imported help, as few of them have families. The barracks have been renovated and furnished and many of the men are fed at the company's restaurants.

F. S. **Chase,** president of the Chase companies, has been the guest of the **Chase Companies of California** for three weeks and with **Mrs. Chase,** made a general inspection of the branch warehouses located in Los Angeles and San Francisco.

The **Chase Metal Works** and the **Waterbury Manufacturing Company** have opened a new office in Atlanta, Georgia, in charge of **J. G. Weddington.**

E. H. **McGar,** formerly in charge of the physical and chemical laboratory at the **Bristol Brass Company,** is now in charge of the chemical laboratory of the Chase Metal Works.

Stewart **Atwood,** accountant of the Chase Companies, has left the concern and taken employment with a firm in Watertown.

Important price reductions, the first to be made in a long time, have been announced by the **American Brass Company.** The announcement calls for a 1¼ cent reduction on so called common brass, the same amount on sheet copper products and a one cent reduction on seamless tubes.

Officials of the company state that the reduction is a natural one, the result of the drop in the price of ingot copper and zinc, which have taken a substantial drop within the last 30 days. It takes a considerable drop in ingot copper to affect the rolled product but the drop of the past 30 days warrants the reduction.—W. R. B.

BRIDGEPORT, CONN.

JUNE 1, 1923.

Industries are now so busy that it is hard to get employees and attracted by the steady employment and good wages, common and skilled laborers have been flocking here from all parts of the country within the last month. Lumbermen from Maine and plantation hands from the South have taken employment here in large numbers within the past few weeks.

The **United States** government has brought suit against the **Naugatuck Valley Crucible Company,** of this city, for $270 alleged to be due for undercharges for transportation of freight, the suit resulting from the government ownership of the roads in 1917 to 1919. The suit is brought by **John B. Payne,** director general of the railroads. In March, 1918, four car loads of common clay were shipped to the Naugatuck Valley Crucible Company from the **Illinois Zaolin Company,** of Jonesboro, Ill. The count sets forth that the transportation charges should have been $154.17 but were only $48.92 and that similar errors on other loads made a total of $270. The Crucible Company has filed a cross complaint against the railroad director general for $2,000 damages for destruction of valuable crucibles in transmission from Illinois.

Stanley Bullard, of the **Bullard Machine Company,** has been reappointed by Gov. Templeton as a member of the commission on railroad consolidation which is trying to arrive at the best solution for the scheme to consolidate all of the New England railroads into one system or join them either as a whole or individually with one or more continental trunk lines.

Bridgeport shippers, in co-operation with others throughout New England, have filed a brief with the Interstate Commerce Commission, charging the shipping board with lending aid to the creation of monopoly by "one group of citizens to gouge another group." Under provisions of the merchant marine act, ship owners having vessels under United States registry on the Great Lakes have been arguing for the elimination of the Northern Navigation Company and other Canadian lines from participation in traffic between points in the United States and the shipping board at commerce commission hearings has supported this contention.

The Bridgeport shippers, New England Traffic League and Chambers of Commerce throughout the section, declare that protection should be offered to ships of American registry, but that when it reaches the point where it allows the operators of American ships to monopolize the trade and as a consequence of that monopoly force the public to pay higher rates and to endure only such service as they care to extend, it is high time that a little competition should be injected regardless of where the competition comes from.

Judge **John J. Walsh** has handed down a judgment of $737.46 in favor of the **Bridgeport Iron and Metal Company** in its breach of contract suit against the **S. F. Alperin & Son Company,** of Boston. It was claimed by the plaintiff that on April 29, 1920, the defendant entered into a contract to purchase a carload of brass briquets from the plaintiff, which contract it failed to keep.—W. R. B.

TORRINGTON, CONN.

JUNE 1, 1923.

Harmon J. Cook, of Torrington, formerly superintendent of one of the **Torrington Company** plants, has been elected

secretary and assistant general manager of the **Trumbull-Vanderpoel Electric Company,** of Bantam, and is devoting his entire time to the duties of these offices. This concern is greatly increasing its activities and its output, and on account of the housing shortage in the village is planning to erect a group of new houses on land adjacent to its plant.

Frederick F. Fuessenich, formerly head of the **Hendey Machine Company** and one of the best known manufacturers in the Naugatuck Valley, observed his 75th birthday on May 7.

A certificate of organization has been filed by the recently formed **Altman Manufacturing Company.** The officers are: President, Alexander Altman; treasurer, Charlotte Altman; secretary, Eugene Altman, all of Torrington.

The factories of Torrington are co-operating with the Torrington Business Men's Association in the distribution of folders giving facts about Torrington. The folders are being included in nearly all the mail sent out from the various plants.

The lifting of all embargoes and the placing of another through freight train—"the pier freight"—has greatly relieved transportation conditions for Torrington industries. Shipments of raw materials are coming through most satisfactorily and no trouble is being experienced in shipments of finished products. This is in strong contrast to conditions which existed a few months ago.

The labor question is one of the problems today. Common labor has been scarce for some time and the scarcity has been made more acute as a result of activities in farm, road building and general construction work. High wages paid by the building trades have attracted many away from the shops. —J. H. T.

ROCHESTER, N. Y.

JUNE 1, 1923.

Weather conditions have had no effect whatever upon industrial activities in Rochester this spring, and until April every metal-using plant in Rochester was running at almost high tide. This period of prosperity has reached the peak, however, and is now slowing up to a marked extent. The approach of the summer season has not brought about this slackening of industry, but it is due to the general abatement of business which seems to prevail in all sections of the country.

Officials of the larger establishments are not inclined to discuss the situation, claiming that there is little to say except that the annual letting down in speed is at hand. It is a fact, however, that not so much business for early delivery has been received in Rochester as in the weeks prior to the advent of spring, and inquiry reveals the fact that there has been an over-production in some lines. The sudden let-down in building has not had much effect here, except in a retail way.

There is not a very marked demand for copper at this time, but business is said to be very good in the brass foundries and electro-plating establishments about the city. All brass workers are employed at full time at present. Aluminum and tin are in firm request, and stocks of the former are said to have been depleted in the larger plants about town.—G. B. E.

DETROIT, MICH.

JUNE 1, 1923.

Manufacturers of every line of brass, copper and aluminum products here report a steady run of business and attribute the favorable conditions to intensive trade operations throughout the country. However, most of them are using the greatest caution to avoid being caught in the condition that many of them were at the close of the war when everything was at such a boom. Everyone is buying carefully and judiciously. There probably is less capital tied up in supplies in Detroit than ever before—that is, supplies that are not immediately needed and cannot be moved rapidly.

The automobile concerns, which buy heavily in brass, copper and aluminum, are still speeding up and it is quite certain they will continue in high production throughout the year. Manufacturers of plumbers' supplies also are well booked with orders, heavy building operations everywhere having caused an unusual demand for these materials. The future in this line, however, is not quite so promising as in others, as there is every indication of an early curtailment of building due to excessive costs and the inclination of banks to curb lending.—F. J. H.

PITTSBURGH, PA.

JUNE 1, 1923.

No indications developed during this month of any halt to the forward movement in the metal industry, say manufacturers of this district. Practically every plant is operating to the very limit of its facilities, while they are ahead of all previous records in output. The books of many of these industries are open for third quarter business and many big orders are being placed. Some of the mills are unable to run at 100 per cent because of the shortage of common labor and other workers.

While industries continue to find it difficult to maintain an adequate labor supply, the situation lately has shown improvement. This applies to common labor as well as to skilled and semi-skilled operatives. There is by no means a surplus, and more men could be used by almost all interests, but the shortage is not so pronounced as it was until recently. However, considerable local interest centers in the annual wage conference which opened in Atlantic City, N. J., in the week of May 21st, to determine the wage scale for employes in the plants of pipe makers and metal industries.

A ten per cent increase in wages of common labor at the plant of the Belmont Stamping and Enameling Co., at New Philadelphia, Ohio, will increase wages from 35 to 38½ cents an hour.—H. W. R.

CHICAGO, ILL.

JUNE 1, 1923.

The Chicago metal market was generally lower than it was last month, some metals striking a stopping point and others reacting. The manufacturers are still cautious in buying, evidently refusing to purchase hurriedly at the first sign of passing the bottom.

According to a statement by **F. W. Leuthesser,** President of the **Kelly Brass Works,** who are large users of copper, while the market is not steady they are having no trouble in getting copper. The problem of getting and keeping good men, however, is formidable with them, he declares, as it is with others in the trade.

The **Nagel-Chase Company** manufacture metal specialties and A. B. Anderson, secretary, says that their latest feature is a caster which has all the advantages of the ball bearing caster but none of its disadvantages. Mr. Anderson reports business as being very good. They are working full capacity and have been compelled to shut down on new orders for the present.

The **Dallas Brass & Copper Company** says that the market on copper has gone down but that things are steady and they do not look for a further decline. They claim little labor trouble, stating that mills in smaller towns have to employ practically everybody in town but in a large city like Chicago there is always a man to take the place of the one who leaves.

The Chicago membership of the **American Foundrymen's Association** was well represented at the convention held in Cleveland, April 28 to May 3. All the officers from the Chicago Headquarters attended the convention.—E. J. C.

BOSTON, MASS.

JUNE 1, 1923.

Considerable slackening in orders is noticed among brass foundries handling job work. Several foundries that were operating near capacity in April, and had shown continued improvements since the first of the year, are now operating around 50 to 75 per cent of capacity. Most foundrymen, however, expect the present let up to be of short duration. In fact some are already reporting improvement over conditions prevailing a few weeks ago.

Foundries manufacturing specialties, however, continue to do a splendid business with plenty of orders in sight. The **Thomann Brass Foundry,** a specialty concern, is operating at capacity and an addition to its Medford plant will be started next month to enable them to handle their rapidly increasing business.

The **Finlay Brass Works** report smaller operations for May with present production about 50 per cent of normal.

R. E. Parker **Manufacturing Company,** of Reading, has been incorporated to manufacture metal specialties with a capital of $10,000. The incorporators are Robert E. Parker, Herbert W. Hunt and Preston F. Nichols, all of Reading.

The **Richard Dimes Company,** of Boston, has been incorporated with a capital of $30,000 for the manufacturing and plating of metal articles. The incorporators are Richard Dimes and Samuel T. Dimes, of Boston, Bertram F. Dimes, of Winthrop, and Richard Dimes, Jr., of Chelsea.—C. W. R.

TRENTON, N. J.

JUNE 1, 1923.

Hardware manufacturers do not believe that the cancellation of contracts for many big building operations in New York will seriously affect them because of the great amount of building in other parts of the country. "We are bound to feel it a little," said one manufacturer, "but not enough to do any harm." **William G. Wherry,** president of the **Skillman Hardware Manufacturing Company,** says that business has had a tendency to slow up a little during the past month, but that he was optimistic over the future. The Skillman Company, however, is busy at the present time.

The **Trenton Emblem Company** is rushed with work and is working overtime to turn out the work. The **John A. Roebling's Sons Company** is busy in all the departments and recently secured a large contract to supply cables for the Hudson river bridge at Bear Mountain. The company will furnish 2,000 tons of bridge wire and suspension rope. The bridge will consist of main span 1,632 feet in length. The **Jordan L. Mott Company** also reports business as being very good.

The Trenton factory of the **Ingersoll-Trenton Watch Company** has been closed and some of the machinery removed and the plant and grounds placed on the market by the **Waterbury-Clark Company,** which bought the plant at receiver's sale some time ago. The Clark company offered employment to the Trenton employes of the Ingersoll plant at factory in Waterbury, Conn., and some have accepted. **R. E. Dow,** secretary of the Waterbury-Clark Company, has decided to close the Trenton factory and have all the work in the future done at the Connecticut works.

The **American Type Founders Company,** of 300 Communipaw avenue, Jersey City, has filed an amendment to its charter at the state house, Trenton, increasing the capitalization from $7,000,000 to $10,000,000.

Sanitary Supply Company, of Asbury Park, N. J., has been incorporated at Trenton with $250,000 capital to make plumbing supplies. The incorporators are James M. Denny, Charles A. White and Frank W. Dows, of Philadelphia.

Harrison Lock Works, Harrison, N. J., has been incorporated with $150,000 at Trenton to manufacture trunk hardware. Patrick J. Gorman, of Harrison; Anthony J. Pulumbo, of Newark, and F. J. Welte, of Bloomfield, are the incorporators.

Plainfield Plumbing Company, of Plainfield, N. J., has been incorporated at Trenton with $100,000 capital to deal in hardware. The incorporators are Ingfred T. Madesn, Samuel G. Lavine, of Perth Amboy, and William O. Reinhart, of Elizabeth.

The enameling department of the **Jordan L. Mott Company,** Trenton, N. J., was recently badly damaged by flames, entailing a loss of about $25,000. The blaze started when oil on the floor of the shop became ignited from the big furnaces and ignited a large tank filled with crude oil used in the process of enameling of bath tubs. The interior of the building, which is 200 feet wide and 300 feet long, was gutted and the roof burned off. Firemen prevented the flames from communicating to the other departments. Despite the serious damage done the Mott Company was not compelled to cease operations in the enameling department. Repairs were made immediately after the furnaces were found to be intact. The Mott Company is very busy at the present time.

The J. L. Mott Company recently placed into effect an increase for the employes, the raise ranging up to 5 cents an hour. It was erroneously stated in these columns that the Mott workers had been turned down whey they sought increased wages. This information was furnished THE METAL INDUSTRY correspondent by an employe of the concern before the increase came, and was, of course, an error.—C. A. L.

PROVIDENCE, R. I.

JUNE 1, 1923.

Business in all lines of the metal industry is exceptionally good, according to the reports that come to hand from all sections of the State. For several months skilled labor has been at a high premium and growing scarcer, while unskilled labor is obtained with difficulty. There are no serious labor controversies in Rhode Island, either in the metal trades or other industries, and with plenty of orders on hand, good wages and satisfactory hours, the future appears roseate both for employer and employe, for an indefinite period.

All lines in the jewelry class are busy although not rushing and most of the shops are operating on a normal basis. In the building lines, more activity is noticeable than in many months and in the heavier branches conditions appear satisfactory.

Announcement was made the past month of the reorganization of the **Paye & Baker Co.,** following the recent death of **Frank L. Baker.** The officers are as follows: President, A. A. Gordon; vice-president, H. E. Paye; treasurer; J. N. Shawe; assistant treasurer, William H. Ryder; secretary, A. J. Morawski. All of the men have been connected with the company for many years and they have purchased the interest in the firm that was held by the Baker estate.

During the past few weeks H. J. Astle & Company, Inc., of Providence, has installed in various jewelry factories throughout the United States and Canada a number of Boland systems which would indicate, judging from the unusually large list, that business is at present good among the jewelers and the outlook promising.—W. H. M.

INDIANAPOLIS, IND.

JUNE 1, 1923.

The only reason why the **Kokomo Brass Work** and allied industries at Kokomo, Ind., are not employing more men and producing more merchandise is because they are now crowded to capacity. **J. W. Johnson,** secretary-treasurer and general manager told more than 100 executives and salesmen and several guests at a banquet recently in connection with a three days' sales conference. Mr. Johnson said the volume of business now being obtained by the companies exceeds even that of the boom period of 1920, adding that the management would find it difficult all this year to provide adequate room for production.

The **Zenite Metal Company,** of Indianapolis, is made defendant in a suit alleging infringement of patent filed in federal court by the Curtain Supply Company, of Chicago. Triple damages are asked, together with an injunction to present further alleged infringement. The manner in which the amount of damages is ascertained would be by examination of books. The judgment asked would be three times the profit shown as having come from the sale of the window sash. H. I. Duckwald, president of the Zenite Metal Company, said his company had ceased the manufacture of windshields which contain the device on which the plantiff claims infringement. He said only about fifty had been manufactured.

Frank Shellhouse and **C. A. Wulf,** both of Indianapolis, have acquired the plant of the **American Tank & Valve Company** at Mars Hill, a suburb, and the plant will be operated to manufacture brass products. Production will begin soon.

The **Indiana Aluminum Ware Company,** of Elkhart, Ind., has filed a preliminary certificate of dissolution.

The **Fort Wayne Superior Plating Works, Inc.,** has been organized at Fort Wayne, Ind., with a capital stock of $5,000

for the purpose of rebuilding metal fixtures. The directors are Raymond G. Heingartner, Charles F. Braun and Louis E. Gollmer.—E. B.

BIRMINGHAM, ENGLAND

MAY 18, 1923.

After a period during which the rate of improvement seemed to be slackening business in the metal trades is again steadily on the increase. The brass foundry industry is active especially in steam and water fittings and sanitary equipment. Trade with South America, which for a long time has been very poor is now showing some improvement. South Africa also is becoming an increasingly profitable market. Home trade is brightening considerably especially in builders' requirements. A long standing wages dispute in the building trade which it was feared would result in a general lock-out has been settled by arbitration and it is expected that many housing and other building schemes which have been in suspense will now be proceeded with. The furniture trade is also improving and as export business continues to increase cabinet brassfounders are getting busy. Sheet rolling mills are well employed but the demand for tubes shows some falling off. The automobile industry is providing a growing amount of work for aluminium founders, and makers of brass fittings, lamps and other accessories. Wireless telephony is still finding a great deal of work for wire drawers and to the makers of brass components of receiving sets but the demand has slackened somewhat owing to uncertainty as to the policy of the Postmaster-General with regard to the licensing of amateurs who make their own sets. The **British Broadcasting Company, representing** most of the leading makers of wireless apparatus is strongly opposed to the concessions which the amateurs desire—G.

Business Items—Verified

U. T. Hungerford Brass & Copper Company, Hungerford Bldg., New York, plans the erection of a building at Boston, 2 stories, 80 x 240 ft.

The Lake Erie Metal Products Company, care J. F. Strand, 4001 West 25th street, Cleveland, Ohio, has had plans prepared for the construction of a 1-story factory on East 152nd street. Estimated cost $50,000.

Barker Brothers, Inc., have moved from their old address to larger quarters at 327 Johnson street, corner Leo place, Brooklyn, N. Y. They have extended their stock of platers' and polishers' supplies to include a full line for immediate shipment.

The Reading Knob Works, Reading, Pa., are having plans prepared for the erection of a foundry extension to be built at an estimated cost of $35,000. This firm operates the following departments: brass foundry, brass machine shop, tool room, grinding room, plating, japanning, polishing, lacquering.

Jos. W. Hays is just completing the organization of a corps of consulting combustion engineers to be known as **Jos. W. Hays and Associates.** The headquarters of the organization will be Michigan City, Ind. They will be prepared to render consulting service in steam plants in all parts of the country.

The Danville Galvanizing Company, Danville, Pa., recently organized with a capital of $50,000, is planning the establishment of a new plant to manufacture galvanized metal products. The company is headed by Harold R. Pursel and Irving Vannan, Jr., both of Danville. This firm operates the following departments: cuttin-up shop, galvanizing.

Fire, April 21, destroyed a portion of the plant of the **Twin City Brass & Aluminum Foundry Company,** 815 Washington avenue, S. E., Minneapolis, Minn., with loss estimated at $25,000. It is planned to erect a new plant immediately. This firm operates the following departments: brass, bronze and aluminum foundry, brass machine shop.

Monarch Manufacturing Company, 620 St. Antoine Street, Detroit, Mich., is erecting a new factory on Hart avenue to manufacture builders' hardware. The building is costing $35,000. This firm operates the following departments: brass, bronze and aluminum foundry, brass machine shop, tool room, grinding room, plating, polishing, lacquering.

Work will commence on a one-story plant at 90 Arthur Street, Buffalo, for the storage of raw material, for the **Buffalo Bronze & Die Casting Corporation.** This plant will be used to relieve congestion in one of their departments. This firm operates the following departments: brass and bronze foundry.

The **Nulite Polish Company,** which for some time has been located at 174 North Fourth street, Brooklyn, N. Y., has been forced to move to larger quarters. The company has leased a four-story building at 248-250 Plymouth street, Brooklyn, and will utilize the building in its entirety. The removal will take place on June 1, 1923.

The Marlboro Wire Goods Company, Marlboro, Mass., has acquired property on Lincoln street as a site for a new two-story and basement plant, 70 x 150 feet, for which plans are nearing completion. It will cost about $35,000. This company operates japanning, stamping, tinning, soldering and lacquering departments, and is in the market for a wire-straightener for ¼ in. and 5/16 in. wire and power presses.

The Orlando Manufacturing Company, P. O. Box 1256, Orlando, Fla., manufacturer of metal products, has inquiries out for complete machine shop equipment, including lathes, milling machine, drill press, grinder, bench and hand tools. This firm operates the following departments: brass, bronze and aluminum foundry, brass machine shop, tool room, grinding room, casting shop, cutting-up shop, plating.

Archibald R. Watson, President, **Balbach Smelting & Refining Company** and director of Hamilton National Bank, entertained at dinner the evening of Tuesday, May 15th, at the Metropolitan Club, Fifth avenue and 60th street, in honor of Edmund D. Fisher, president of the Hamilton National Bank, the Hamilton New York Corporation and the Hamilton Safe Deposit Company. Among the guests were many men prominent in the world of finance, metallurgy and professional life.

The Colonial Brass Works, Inc., New Britain, Conn., have purchased the baum electro-plating plant in Plainville, Conn., and will move there June 1. Alterations will be made to the 2-story building to provide a foundry. The number of employees will be more than doubled. This firm operates the following departments: brass, bronze and aluminum foundry, brass machine shop, tool room, grinding room, cutting-up shop, stamping.

For the third time the **Great Western Smelting & Refining Company** has outgrown its plant in St. Louis. Plans have been completed and bids are now being let for the construction of a two-story smelting and refining plant and office building, to be located on Park avenue. The building will cost about $100,000 and will be completed in six months. The company is now temporarily located at 828 Gratiot street, St. Louis, Mo.

The Prime Manufacturing Company, 653 Clinton St., Milwaukee, Wis., manufacturing brass and bronze castings and parts for the railroad, automobile and other industries, has increased its capital stock from $150,000 to $500,000 for further extensions of plant and equipment and working capital. Orton L. Prime is president. This firm operates the following departments: smelting and refining, brass, bronze and aluminum foundry, brass machine shop, tool room, grinding room.

Lees Hall, 521 Maryland Ave., Brooklyn, Baltimore, Md., has resigned his position with the Monarch Engineering and Manufacturing Company of Baltimore, Md. Understanding all makes of furnaces, oil, gas, and coke fuel, both in Europe and America, he is now going to handle the used furnaces on the market. In addition he proposes to help all furnace users in converting the old coke fired furnaces to oil or gas and also to supply detailed drawings for building batteries of stationary furnaces, for melting brass, aluminum, etc.

The Norton Company, Worcester, Mass., will enlarge its electric furnace plant at Chippawa, Canada, by the addition of a furnace building 70 x 150 ft. to be used exclusively for the manufacture of carbide of silicon abrasive, known to the trade as crystolon. Other buildings for storage and the like will be added, and there will be some rearrangement of existing facilities to give a total increase in capacity of 25 per cent. The supply of this raw material at the Worcester plant has become inadequate, making immediately necessary further production units.

New England is to be the host of the next **National Foreign Trade Convention,** according to **James A. Farrell,** Chairman of the National Foreign Trade Council, and President of the United States Steel Corporation. The meeting will be held in Boston probably during May, 1924. The invitation to meet in

Boston has the backing of the State of Massachusetts, the city of Boston, and the Boston Chamber of Commerce. It is now planned to enlist the co-operation of every manufacturing community throughout New England in what is expected to be the largest Foreign Trade Convention ever held in the United States.

Within a short time a new industry will open in New Castle, according to William Cosel, vice-president and general manager of the **New Castle Metal Products Company,** formerly Warren **Metal Products Company.** The new company is erecting a 40 x 135-ft. concrete building on Sampson street, and will manufacture stamped products such as hot air registers, grills, ventilating faces, ceiling plates and the like. Up until recently the company has been operating in Warren, Ohio, but the possibilities for expansion seemed larger in New Castle, and the plant equipment has been moved. This firm operates the following departments: japanning, stamping.

The E. **T. Fraim Lock Company,** Lancaster, Pa., is planning to erect an addition to its brass foundry. The building will be of modern foundry construction, of brick, steel and concrete. One wing will be utilized as a fire-proof pattern vault. The wing on the opposite side of the structure will be used as a power house and will contain the fan and positive pressure blowers for the brass and iron melting furnaces, as well as some special machinery. This firm operates the following departments: brass, bronze and aluminum foundry, brass machine shop, tool room, grinding room, galvanizing, plating, japanning, stamping, polishing, lacquering.

The **National Association of Manufacturers** at its final business session at the Waldorf-Astoria, New York City, warned that a continuous supply of coal at reasonable price was vital to the health, safety and industry of the country, and declared in favor of collective bargaining agreements which would be made binding and subject in case of dispute to independent judication. The manufacturers also went on record as favoring the national budget system. The association pledged its aid to the War Department in working out plans under the National Defense act for the prompt and harmonious mobilization of industry in the event of a national emergency.

Producing 2,500,000 pounds of sheet aluminum per month, the **United States Aluminum Company** at Alcoa, Tenn., has during the past three months not only broken all of its own records, but eclipsed the output of similar mills owned by the company at Niagara, Falls, N. Y., New Kensington, Pa., Edgewater, N. J., and Toronto, Canada. Employees during the three months worked hard to achieve this production record. So pleased was S. A. Copp, superintendent, with this spirit that he personally tendered a feast to the 1,200 employees and announced in an address to them that the company had given him permission to raise the wages of as many as possible, keeping in mind both length of service and efficiency. This firm operates an aluminum rolling mill.

William Whittam, formerly the Special Agent in England of the United States Department of Commerce, has organized the firm of **Middleton-Whittam, Inc.,** 565 Fifth Avenue, New York, N. Y. The company is working in close co-operation with the leading associations of British manufacturers, among whose membership he is well known as the American correspondent of several of the leading trade journals in England. The compulsory working clause of the British Patents Law places every unworked American invention in jeopardy. Middleton-Whittam, Inc., which is an international business clearing house, is equipped to remove the hazard of cancellation or compulsory licensing by providing for the working of American owned patents by responsible and properly equipped British organizations.

INCORPORATIONS

Lea Manufacturing Company, Waterbury, Conn., lacquers, electro-plating materials, etc., has been incorporated with a capital stock of $50,000.

Nels Johnson, 1302 Washington Avenue, Racine, Wis. is organizing a $25,000 corporation which will lease a building and install equipment for the production of aluminum rims for bicycle tires. He has been granted letters patent on twelve points and the exclusive right to manufacture the rims either by casting or by rolling and welding. The latter method will be used at the start. Manufacturing operations have been started.

The **Goshen Stamping & Tool Company,** Jackson & Ninth streets, Goshen, Ind., has been incorporated to take over an established business in the manufacture of machinery, tools, dies, molds and sheet metal specialties. The business taken over will be enlarged. This firm operates the following departments: brass machine shop, tool room, grinding room, cutting-up shop, spinning, stamping.

The St. Louis Stamping & Tool Company, 123 Pine Street, Saint Louis, recently incorporated to manufacture dies, tools and metal specialties, has a fully equipped factory now in operation. From time to time the company will be in need of additional punch press equipment, and expects to be in the market for one or two such presses within a month. George C. Hargrave is secretary. The company operates a brass machine shop, tool room, grinding room and stamping shop.

The S. K. Williams Company, Milwaukee, Wis., has been incorporated with a capital stock of $30,000 to manufacture metal products. It takes over the partnership business of S. K. Williams & Company, for several years conducting a machine and electro-plating shop at 848-850 Thirty-second street, which will be enlarged and additional equipment installed. S. K. Williams is president and general manager. This firm operates the following departments: galvanizing, plating, japanning, polishing, lacquering.

ELEKTRON METALS CORPORATION

In THE METAL INDUSTRY for January, 1922, was published an article describing Elektron Metal, a magnesium alloy produced in Germany. This alloy will now be obtainable in the United States in any quantity. A company called the Elektron Metals Corporation of America with offices at 2 Rector street, New York, has been organized to import, and later to manufacture the metal. Directors are George G. McMurtry, Veryl Preston, A. P. Rippenbein, H. Pendleton Rogers and W. C. Rowland. A complete description of Elektron metal, its varieties, properties and uses will be found in THE METAL INDUSTRY for January, 1922.

BUSINESS TROUBLES

Earl H. Turner has been appointed receiver of the **Davis Sewing Machine Company.**

Notice has been given that **Samuel D. Leidesdorf** has been appointed temporary receiver of **McNab & Harlin Manufacturing Company,** pursuant to an order of United States Circuit Court Judge Julian W. Mack, dated May 1, 1923, and a hearing was held before said judge on May 25, 1923, at 9:30 o'clock a. m., room 337 Woolworth Building, New York City.

On March 28, 1923, the District Court of the United States, sitting at Hartford, Conn., appointed **U. S. Ayer** receiver of the **Ayer-O'Connell Manufacturing Company** and of the **Bennett-O'Connell Company.** The suit was necessitated by complication of title and of corporate organization, which counsel advised could only be cleared up by a judicial proceeding and receivership to conduct business of the corporations while that readjustment was going on. The business of both companies will be continued as usual.

The Protective Committee representing the holders of the first mortgage of 6 per cent. ten-year bonds of the **National Conduit and Cable Company,** Hastings-on-Hudson, N. Y., has announced that it has received an offer from a responsible party to buy all of the bonds deposited with the National City Bank at a price of $700 net cash for each $1,000 bond. The committee has sent a letter to all holders of the bonds outlining the terms of the offer. Holders have until June 5 to deposit these securities.

The Metal Finishers Supply Company, Inc., 489 Broome street, New York City, announces that it is unable to pay its liabilities. The indebtedness amounts to slightly over $12,000, and the assets amount to about $875. In view of the fact that on a forced sale nothing would be realized for the creditors, the largest creditors have been induced to defer their claims for the time being and **Combined Industries, Inc.,** 17 West 42d street, New York City, the largest creditor has offered to purchase the small claims for 33 1/3 per cent. of the face value. This offer is conditional upon acceptance by 75 per cent. of the creditors above mentioned. G. W. Levett, formerly with the Metal Finishers' Supply Company, is president of Combined Industries, Inc.

METAL STOCK MARKET QUOTATIONS

	Par	Bid	Asked
Aluminum Company of America	$100	$465	$510
American Hardware Corporation	100	52	55
Anaconda Copper	50	46	46⅛
Bristol Brass	25	12	15
International Nickel, com	25	13½	14
International Nickel, pfd	100	78	79
International Silver, com	100	55	65
International Silver, pfd	100	106	110
National Conduit & Cable	100	⅝	1
National Enameling & Stamping	100	65¼	65¾
National Lead Company, com	100	119	120
National Lead Company, pfd	100	108	112
New Jersey Zinc	100	160	162
Rome Brass & Copper	100	115	130
Scovill Manufacturing Company, new	...	170	175
Yale & Towne Manufacturing Co., new	...	62	64

Corrected by J. K. Rice, Jr., Co., 36 Wall Street, New York.

CRUCIBLE STANDARDS

The Plumbago Crucible Manufacturers of the United States have recently completed, after more than two years' investigation, planning and experimentation, what is undoubtedly the most important work ever undertaken in that industry, namely, the standardization of crucible sizes on a scientific basis.

Exterior shapes and dimensions were worked out for each size so that they would have a true and uniform relationship to every other size, the basis for capacity being three pounds of molten copper per number with an allowance of 10 per cent. for working space. It was found that this gave an increased capacity on the larger sizes, but that on the sizes from No. 100 down it gave a smaller crucible than had previously been supplied by most of the crucible manufacturers, and a crucible user who, for example, had been using a No. 50 pot, would have to order a No. 60 in the new size to give him the capacity to which he had been accustomed.

To avoid endless confusion and friction with the trade it was determined to adopt the new standards on the basis that had been developed and step them back to the next lower number covering all sizes below No. 100. The dimensions of a theoretical No. 110 pot were used for the new No. 100 size. Under this plan, practically all of the new sizes come close to the average capacities of the old style pots formerly manufactured, **and the user may continue to purchase the size to which he has been accustomed.**

The "American Standard," as the new sizes are designated, is being received with genuine appreciation by the trade because of the fact that more than 90 per cent. of the crucible output of the country is now being made in these sizes, therefore a crucible user can buy pots from almost any crucible manufacturer and not be compelled to change his tongs to suit each new lot of crucibles that he may want to try out. Needless to say, the tong manufacturers welcome the opportunity to standardize on one size of tong for each number of crucible.

The new sizes are as follows:

STANDARD SIZES OF BRASS CRUCIBLES

Number	Height Inches	Top Inches	Bilge Inches	Bottom Inches	Approx. Cap. in Pounds Water
0	2	1⅝	1¾	1¼	
00	2¼	2	2	1½	
000	2⅝	2⅛	2⅛	1⅝	
0000	3	2⅝	2⅝	1¾	
1	3⅛	3⅛	3⅛	2⅜	.39
2	4¼	3½	3⅞	2⅞	.78
3	4⅞	4	4½	3½	1.17
4	5½	4½	5	3¾	1.82
5	6⅛	4⅞	5⅛	4	2.21
6	6½	5¼	5¾	4¼	2.60
8	6⅞	5⅞	6⅛	4½	3.13
10	8 1/16	6 1/16	6 2/16	4 3/16	4.8
12	8½	6⅜	6⅞	5 1/16	5.6
14	8⅞	6 3/16	7 1/16	5⅛	6.4
16	9¼	6 3/16	7½	5½	7.2
18	9 3/16	7 1/16	7 3/16	5 3/16	8.6
20	10 1/16	7 3/16	8⅛	6⅛	10
25	10 3/16	8 1/16	8⅞	6½	12
30	11½	8⅝	9 1/16	6 3/16	14
35	12	9	9¾	7⅛	16
40	12½	9⅜	10⅛	7 1/16	18
45	13 1/16	9⅞	10 3/16	7 3/16	21
50	13¾	10¼	11⅛	8⅛	24
60	14 1/16	10 3/16	11 3/16	8 1/16	28
70	15 1/16	11¼	12 1/16	8 3/16	32
80	15⅝	11 3/16	12 3/16	9¼	36
90	16 1/16	12⅛	13⅛	1/16	40
100	16 3/16	12½	13½	9⅞	44
125	17⅜	13	14 1/16	10 1/16	50
150	18⅜	13¾	14⅞	10⅞	60
175	19¼	14⅜	15 1/16	11⅜	70
200	20	15	16¼	11⅞	80
225	20¾	15½	16 3/16	12 1/16	90
250	21⅜	16	17 1/16	12 3/16	100
275	22	16 1/16	17 3/16	13	110
300	22½	16⅞	18¼	13⅜	120
400	24 1/16	18 1/16	19 3/16	14 1/16	160

1 lb. water = .96 pints or 27.7 cubic inches.

TRADE PUBLICATIONS

A Quarter Century of Cumulative Bibliography—1898-1923. A booklet issued by the H. W. Wilson Company, 958-964 University avenue, New York City, on their twenty-fifth anniversary, in which something of general bibliographical interest as well as an account of their publishing business may be found. This booklet is illustrated.

Paxson Pneumatic Rotary Brush. A folder issued by J. W. Paxson Company, Philadelphia, Pa., illustrating and describing their pneumatic rotary brush.

An official catalogue and price list, in effect January 1, 1920, has been issued by the **National Association of Brass Manufacturers,** City Hall Square Building, Chicago, Ill.

The Shipping Situation of the World. An address delivered by James A. Farrell, chairman, National Foreign Trade Council and president of the United States Steel Corporation before the Tenth National Foreign Trade Convention, New Orleans, La., May 4, 1923.

Roller-Smith Triplex Ammeter. Bulletin No. 30, issued by the Roller-Smith Company, 233 Broadway, New York City. This bulletin covers a new type of ammeter developed recently.

"The Metal of a Hundred Uses." A folder issued by Apollo Metal Works, La Salle, Ill., giving the uses for Apollo nickel zinc.

F. A. Coleman Ovens. An attractive and well illustrated catalogue issued by the F. A. Coleman Company, Cleveland, Ohio, on their core ovens, mold ovens, core racks, core cars, mold cars and transfer cars.

"Brooklyn." A booklet issued by the Industrial Department of the Brooklyn Chamber of Commerce, 32 Court street, Brooklyn, N. Y., telling why Brooklyn, the greatest borough of the greatest city in the world, is the fourth industrial city of the United States. This booklet is attractively illustrated.

The Naugatuck Valley Crucible Company, Shelton, Conn., has issued a booklet on a condensed history of crucibles, including a table of standard sizes of regular stock crucibles.

Some Recent Work. A folder issued by Dwight P. Robinson and Company, Inc., 125 East 46th street, New York City, showing monumental buildings, such as apartment houses, hotels, office buildings and similar structures that they have recently completed or now have under construction.

The American Foundry Equipment Company, 366 Madison avenue, New York City, have issued the following bulletins: No. 532, Dust Arresters; No. 534, Sand Blast Barrels; No. 535, Pressure Tanks; No. 536, Automatic Rotary Sand Blast Tables; No. 537, Rotary Table Sand Blast Rooms; No. 538, Rectangular Sand Blast Rooms. Also folders on their Type K. foundry sand cutting machine; No. 611 molding machine; pattern frames, and a booklet on sand cutter users.

The International Chemical Company, Philadelphia, Pa., has issued folders on its compound No. 2B for locomotive and motor parts; compound No. 42 for tumbling barrels; compound No. 2-B, stripper for japan, paint and enamel; how to rid the cleaning department of three pests.

Outline of the History of Washing. A leaflet issued by the Copper & Brass Research Association, 25 Broadway, New York City, illustrating and outlining the history of washing from the beginning up to the present day.

Production of Secondary Metals in 1922

The total amount of secondary metals of certain classes recovered in 1922 amounted to 605,882 short tons, most of which was recovered as a pure metal and the remainder in alloys and salts.

The following statistics, which are issued by the Department of the Interior, were compiled by J. P. Dunlop, of the Geological Survey. They are advance estimates, but will closely approximate the final figures.

Secondary Copper Recovered in 1922

	Short tons.
Copper as metal	98,400
Copper in alloys other than brass	30,700
	129,100
Copper from new scrap	13,300
Copper from old scrap	115,800
	129,100
Brass scrap remelted:	
New clean scrap	154,000
Old scrap	120,000
	274,000
Copper content of brass scrap (averaging 70 per cent copper):	
New scrap	107,800
Old scrap	84,000
	191,800
Total secondary copper:	
From new scrap	120,100
From old scrap	200,800
	320,900
Brass scrap imported	71,962
Scrap copper imported	10,671
Brass scrap exported	3,147
Scrap copper exported	1,400

Secondary Lead Recovered in 1922

	Short tons.
Secondary lead recovered by smelters that treat mainly ores	27,048
Secondary lead recovered by smelters that treat only scrap and drosses	48,432
	75,480
Secondary lead recovered in remelted alloys:	
Lead content of antimonial lead scrap treated at regular lead smelters	459
Lead content of drosses and scrap alloys treated at secondary smelters	83,621
Total lead in alloys	84,080
Total secondary lead recovered	159,560

Metal Market Review

Written for The Metal Industry by METAL MAN

COPPER

The past month was a period of decided unsettlement in copper and the market weakened from 16½ cents, delivered basis, to 15 cents. Sales were confined to comparatively restricted quantities and concessions failed to stimulate notably heavy buying either for domestic account or foreign shipment.

A sagging tendency was maintained for several weeks. Meantime there has been no pronounced decrease in the volume of American consumption, but the lower range of quotations failed to result in conspicuous buying. Bearish influences were started some time ago, however, to keep industry generally from expanding too rapidly and thus avoid a collapse later which would be disastrous to the entire country.

It is probable that active business has caught the spirit of caution to an extent greater than anticipated by the high authorities who sounded out from the house top frequent warnings against inflation. These warnings have been strong factors in shaping sentiment affecting not only the price of copper but values for all descriptions of finished brass.

The copper producers have made recent advances in wages on the strength of more favorable trade conditions, but a reduction of over two cents a pound in selling prices is another blow to the hard hit copper industry. At 15 cents a pound the earning capacity of a goodly number of copper companies is kept down to a persistently low level. Electrolytic delivered at refinery declined to 14¾ cents for moderate quantities.

ZINC

Zinc in common with other metals displayed a declining tendency recently. Consuming demand remained quiet for a considerable period in the past month, although moderate buying was noted as prices became more attractive to buyers. June shipment was quoting 6¾ cents New York and 6.40 cents East St. Louis, but fresh inquiries have appeared and sellers are inclined to be firmer and ask a shade higher for nearby shipments. Galvanizers and sheet manufacturers continue busy and further brisk trade is anticipated for third quarter deliveries.

TIN

Following a fairly firm opening at the beginning of May the market for tin developed an unsettled and weaker tone as the month progressed. This was reflected in a reaction from 45½ cents per pound for Straits tin on May 1st to about 41½c. June 1. Trading in this market was largely between dealers. Purchases by consumers were on a restricted scale, and the buying from that quarter was of a spasmodic character. The market has declined about 10 cents per pound below the peak price of the year, but buyers generally followed cautious policies and not a few showed apprehension of further price recessions in the comparatively near future.

It is interesting to note reports are that the American Smelting & Refining Co. are to close down their electrolytic tin refinery at Perth Amboy, N. J., in July. The Harvey Williams Corporation smelter at Brooklyn, N. Y., will also close July 31. The local industries appear to be unable to compete with the English smelters who treat Bolivian tin concentrates.

LEAD

Market values for lead softened considerably during the past month. Consumption, however, is active, but buyers are more conservative in placing orders at prevailing prices. Present condition of the market is steady on the basis of 7c. to 7.05c. E. St. Louis and 7¼c. to 7.35c. New York delivery. Future deliveries are held at a shade less, but consumers are not inclined to place orders for heavy tonnages very far in advance of actual requirements. Supplies are in good volume, and producers have every reason to keep them ample at present prices. With the prospect of less urgent building demand values may have a chance to become more normal. Mexican lead is coming into this market in substantial quantities for which refiners appear willing to accept orders at 7¼c. New York.

ALUMINUM

The market for aluminum has held remarkably steady for several weeks. Demand is maintained on a good scale, and with moderate offerings there is no special selling pressure apparent to bring values down. Imported metal is quoted at 27c. to 27½c. for 99 per cent. plus and 26½c to 27c. for 98-99 per cent. material. The leading domestic producers abstain from quoting for publication. The demand for their goods is such that they adhere to the policy of quoting privately on actual inquiries only and no longer publish their prices.

QUICKSILVER

Demand for quicksilver is quiet and market dull. Spot supplies are quoting $67 per flask, but there are few inquiries. Buyers ideas are below current prices, and as there are fair quantities in store dealers are more or less inactive. Some holders are asking $68 to $69 for what stock they carry.

PLATINUM

Actual sales are confined to moderate quantities to cover ordinary requirements. Prices remain specially steady at $116 per ounce.

SILVER

The market for foreign silver bullion is quoting 65⅞c. per ounce. A few weeks ago sales were made at 68⅞c. Purchases by the United States Government under the Pittman Act are nearly completed. Offers accepted already may reach the full amount of 200,000,000 ounces which was authorized at $1 an ounce for strictly American product. With the suspension of silver purchases by the United States Government American mined silver will have to be sold in competition with the metal from foreign sources. Silver supplies are fairly large at Shanghai, China. India mints resumed coinage in March, and producers depend greatly on China and India for a large percentage of demand which was until now helped out by the purchases of the U. S. Mint.

ANTIMONY

Importers of Chinese regulus are more anxious for orders lately, but business has been flat for some time past. Prices have weakened and June and July shipments from Orient are heard of at 5 cents c. i. f. New York in bond. The spot article is held at 7c. to 7.10c. duty paid. Sales are unimportant and tone of market decidedly easy.

OLD METALS

Definite weakness has been the feature in the scrap metal market and prices have declined sharply for nearly all grades of old material. It has been a strictly buyers' market lately since the receding tendencies developed in new metals. Market tone is consequently unsettled and prices irregular. Many of the scraps, however, have held up better than market prices for new stock. Supplies of old metals are plentiful for all requirements. Buyers are cautious in placing orders at present levels. Present quotations at which business could be done in round lots are about as follows: Strictly crucible copper, 12¼c. to 12½c.; light copper, 10c. to 10½c.; heavy brass, 6c. to 6¼c.; new brass clippings, 8½c. to 8¾c.; heavy lead, 5½c. to 5¾c.; aluminum clippings, 19c. to 19½c.; old zinc scrap, 4c. to 4¼c., and battery lead, 3½c. to 3¾c.

WATERBURY AVERAGE

Lake Copper—Average for 1922, 13.844—January, 1923, 14.875—February, 15.75—March, 17.25—April 17.125—May 16.125.

Brass Mill Zinc—Average for 1922, 6.283—January, 1923, 8—February, 8—March, 8.70—April, 8.25—May, 7.60.

Daily Metal Prices for the Month of May, 1923

Record of Daily, Highest, Lowest and Average

Metal Prices for June 1, 1923

Date	1	2	3	4	7	8	9	10	11	14	15	16	17
Copper (f. o. b. Ref.) c/lb. **Duty Free**													
Lake (Delivered)	16.625	16.625	16.75	16.75	16.75	16.75	16.625	16.625	16.50	16.25	16.00	15.75	15.75
Electrolytic	16.25	16.25	16.375	16.375	16.375	16.25	16.00	16.00	15.85	15.625	15.375	15.25	15.25
Casting	16.125	16.125	16.25	16.25	16.25	16.125	15.875	15.875	15.75	15.50	15.25	15.00	15.00
Zinc (f. o. b. St. L.) c/lb. **Duty 1¼c/lb.**													
Prime Western	6.80	6.90	6.95	7.10	7.15	7.05	6.85	6.75	6.65	6.65	6.60	6.65	6.70
Brass Special	6.90	7.00	7.05	7.20	7.25	7.15	7.00	6.90	6.75	6.75	6.70	6.75	6.80
Tin (f. o. b., N. Y.) c/lb. **Duty Free**													
Straits	45.125	45.60	45.625	45.125	44.50	43.75	43.75	44.125	47.375	42.25	41.875	41.25	42.25
Pig 99%	Nom.	45.00	45.00	44.375	43.60	42.75	42.75	43.25	42.50	41.375	41.125	40.625	41.875
Lead (f. o. b., St. L.) c/lb. **Duty 2½c/lb.**	7.60	7.60	7.55	7.40	7.20	7.20	7.15	6.95	6.95	6.95	6.90	6.95	7.00
Aluminum c/lb. **Duty 5c/lb.**	27.00	27.50	27.50	27.50	27.50	27.50	27.50	27.50	27.50	27.50	27.50	27.50	27.50
Nickel c/lb. **Duty 3c/lb.**													
Ingot—Internat. Nick. Co.	29	29	29	29	29	29	29	29	29	29	29	29	29
Outside Spot	29	29	29	29	29	29	29	29	29	29	29	29	29
Electrolytic (Internat. Nick. Co.)													
Ni.—99.80 contam. impur.—.14	32	32	32	32	32	32	32	32	32	32	32	32	32
Brit.-Amer. Nick. Corp.													
Ni.—98.50 contam. impur.—.80	30	30	30	30	30	30	30	30	30	30	30	30	30
Antimony (J. & Ch.) c/lb. **Duty 2c/lb.**	7.75	7.75	7.75	7.75	7.625	7.625	7.625	7.625	7.625	7.50	7.50	7.45	7.40
Silver (foreign) c/oz. **Duty Free**	67.75	67.75	67.875	67.75	67.375	66.875	66.875	66.875	66.375	67.50	66.875	66.25	66.875
Platinum $/oz. **Duty Free**	116	116	116	116	116	116	116	116	116	116	116	116	116

Date	18	21	22	23	24	25	28	29	30*	31	High	Low	Aver.	June 1
Copper (f. o. b. Ref.) c/lb. **Duty Free**														
Lake (Delivered)	16.00	16.00	16.00	16.00	15.75	15.625	15.50	15.375	....	15.375	16.75	15.375	16.153	15.375
Electrolytic	15.50	15.50	15.50	15.375	15.25	15.125	14.875	14.75	....	14.75	16.375	14.75	15.635	14.875
Casting	15.25	15.25	15.25	15.25	15.00	14.875	14.625	14.50	....	14.50	16.25	14.50	15.449	14.625
Zinc (f. o. b. St. L.) c/lb. **Duty 1¼c/lb.**														
Prime Western	6.70	6.75	6.75	6.65	6.55	6.50	6.45	6.40	....	6.475	7.15	6.40	6.728	6.50
Brass Special	6.80	6.85	6.85	6.80	6.65	6.65	6.60	6.55	....	6.575	7.25	6.55	6.842	6.60
Tin (f. o. b., N. Y.) o/lb. **Duty Free**														
Straits	43.00	42.625	41.75	42.125	42.50	42.375	41.75	42.25	....	42.625	47.375	41.25	43.345	41.75
Pig 99%	42.375	42.125	47.25	41.50	41.875	41.75	41.25	41.625	....	42.00	45.00	40.625	40.453	41.125
Lead (f. o. b., St. L.) c/lb. **Duty 2½c/lb.**	7.00	7.05	7.10	7.15	7.10	7.10	7.05	7.05	....	7.05	7.60	6.90	7.139	7.05
Aluminum c/lb. **Duty 5c/lb.**	27.50	27.50	27.50	27.50	27.50	27.50	27.50	27.50	....	27.50	27.50	27.00	27.477	27.50
Nickel c/lb. **Duty 3c/lb.**														
Ingot—Internat. Nick. Co.	29	29	29	29	29	29	29	29	....	29	29	29	29	29
Outside Spot	29	29	29	29	29	29	29	29	....	29	29	29	29	29
Electrolytic (Internat. Nick. Co.)														
Ni.—99.80 contam. impur.—.14	32	32	32	32	32	32	32	32	....	32	32	32	32	32
Brit.-Amer. Nick. Corp.														
Ni.—98.50 contam. impur.—.80	30	30	30	30	30	30	30	30	....	30	30	30	30	30
Antimony (J. & Ch.) c/lb. **Duty 2c/lb.**	7.30	7.30	7.30	7.25	7.25	7.20	7.15	7.15	....	7.10	7.75	7.10	7.453	7.00
Silver (foreign) c/oz. **Duty Free**	66.50	66.75	66.875	67.375	66.75	67.00	67.125	66.875	....	66.00	67.895	66.00	67.011	65.625
Platinum $/oz. **Duty Free**	116	116	116	116	116	116	116	116	....	116	116	116	116	116

*Holiday.

Metal Prices, June 1, 1923

INGOT METALS AND ALLOYS

Brass Ingot, Yellow	11½to13
Brass Ingots, Red	14 to16½
Bronze Ingot	14½to17½
Bismuth	$2.85
Cadmium	$1.10
Casting Aluminum Alloys	21 to24
Cobalt—97% pure	$2.85
Manganese Bronze Castings	22 to35
Manganese Bronze Ingots	14 to18
Manganese Bronze Forging	33 to42
Manganese Copper, 30%	28 to45
Magnesium Metal	$1.25-1.50
Parsons Manganese Bronze Ingots	20½to22
Phosphor Bronze	24 to30
Phosphor Copper, guaranteed 15%	21½to26
Phosphor Copper, guaranteed 10%	21 to25
Phosphor Tin, guarantee 5%	48 to58
Phosphor Tin, no guarantee	46 to56
Quicksilver	$69-70
Silicon Copper, 10%.....according to quantity	28 to35

OLD METALS

Buying Prices		Selling Prices
12½to13	Heavy Cut Copper	13½to14
12¼to12½	Copper Wire	13¼to13¾
10¼to10½	Light Copper	11½to12
10 to10½	Heavy Machine Comp.	12 to12½
7½to 8	Heavy Brass	9½to10
5¾to 6½	Light Brass	7½to 8
7½	No. 1 Yellow Brass Turnings	8 to 9
9 to 9½	No. 1 Comp Turnings	10¼to10¾
5¼to 5½	Heavy Lead	6 to 6¼
3½	Zinc Scrap	4 to 4¼
9 to 9½	Scrap Aluminum Turnings	11½to12
15 to15½	Scrap Aluminum, cast alloyed	17 to17½
16 to17	Scrap Aluminum, sheet (new)	18 to19
23	No. 1 Pewter	27
14	Old Nickel anodes	16
22 to24	Old Nickel	26 to28½

BRASS MATERIAL—MILL SHIPMENTS

In effect May 15, 1923

To customers who buy 5,000 lbs. or more in one order.

	Net base per lb.		
	High Brass	Low Brass	Bronze
Sheet	$0.20½	$0.22¼	$0.24⅛
Wire	0.21	0.22¾	0.24⅝
Rod	0.18¾	0.23	0.24⅞
Brazed tubing	0.28½	.....	0.33⅞
Open sea tubing	0.28½	.....	0.33⅞
Angles and channels	0.31½	.....	0.36⅞

To customers who buy less than 5,000 lbs. in one order.

	Net base per lb.		
	High Brass	Low Brass	Bronze
Sheet	$0.21½	$0.23¼	$0.25⅛
Wire	0.22	0.23¾	0.25⅝
Rod	0.19¾	0.24	0.25⅞
Brazed tubing	0.29½	.....	0.34⅞
Open seam tubing	0.29½	.....	0.34⅞
Angles and channels	0.32½	.....	0.37⅞

SEAMLESS TUBING

Brass, 25½c. to 26½c. per lb. base.
Copper, 27c. to 28c. per lb. base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	22½c. net base
Muntz or Yellow Metal Sheathing (14"x48")	20½c. net base
Muntz or Yellow Rectangular Sheets other than Sheathing	21½c. net base
Muntz or Yellow Metal Rod	18½c. net base

Above are for 100 lbs. or more in one order.

COPPER SHEET

Mill shipments (hot rolled)	24¼c. to 25¼c.
From stock	25¼c. to 26¼c.

BARE COPPER WIRE—CARLOAD LOTS

18¼c. to 18½c. per lb. base.

SOLDERING COPPERS

300 lbs. and over in one order	22½c. per lb. base
100 lbs. to 200 lbs. in one order	23c. per lb. base

ZINC SHEET

Duty, sheet, 15%. Cents per lb.

Carload lots, standard sizes and gauges, at mill, 9.20c. basis less 8 per cent. discount.

Casks, jobbers' prices	10¾c. to 11½c.
Open casks, jobbers' prices	11½c. to 12½c.

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga. and heavier, base price	37c.
Aluminum coils, 24 ga. and heavier, base price	35c.
Foreign	45c.

NICKEL SILVER (NICKELENE)

Base Prices

Grade "A" Nickel Silver Sheet Metal

10%	Quality	27¾c. per lb.
15%	"	29¼c. per lb.
18%	"	30¼c. per lb.

Nickel Silver Wire and Rod

10%	"	30¾c. per lb.
15%	"	34¼c. per lb.
18%	"	37¼c. per lb.

MONEL METAL

Shot	32
Blocks	32
Hot Rolled Rods (base)	40
Cold Drawn Rods (base)	46
Hot Rolled Sheets (base)	45

BLOCK TIN SHEET AND BRITANNIA METAL

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more, 10c. over Pig Tin. 40 to 100 lbs., 15c. over 25 to 50 lbs., 17c. over, less than 35 lbs., 25c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. or more, 10c. over Pig Tin. 50 to 100 lbs., 15c. over, 25 to 50 lbs., 20c. over, less than 25 lbs., 25c. over. Above prices f. o. b. mill.

SILVER SHEET

Rolled silver anodes .999 fine are quoted at from 70c. to 72c. per Troy ounce, depending upon quantity.

Rolled sterling silver 67c. to 69c.

NICKEL ANODES

85 to 87% purity	31½c.-34c.	per lb.
90 to 92% purity	35c.	per lb.
95 to 97% purity	37c.	per lb.

Supply Prices, June 1, 1923

CHEMICALS

In Commercial Quantities—New York Prices

Acetone	lb.	.24½–.27
Acid—		
Boric (Boracic) Crystals	lb.	.12
Hydrochloric (Muriatic) Tech., 20 deg., Carboys	lb.	.02
Hydrochloric, C. P., 20 deg., Carboys	lb.	.08
Hydrofluoric, 30%, bbls.	lb.	.08
Nitric, 36 deg. Carboys	lb.	.06
Nitric, 42 deg. Carboys	lb.	.07
Sulphuric, 66 deg. Carboys	lb.	.02
Alcohol—		
Butyl	lb.	.35–.40
Denatured in bbls.	gal.	.38–.45
Alum—		
Lump, Barrels	lb.	.04
Powdered, Barrels	lb.	.04½
Aluminum sulphate, commercial tech	lb.	.02½–.03
Aluminum chloride solution	lb.	.22
Ammonium—		
Sulphate, tech., Barrels	lb.	.03¾
Sulphocyanide	lb.	.65
Argols, white, see Cream of Tartar	lb.	.27
Arsenic, white, Kegs	lb.	.16
Asphaltum	lb.	.35
Benzol, pure	gal.	.60
Blue Vitriol, see Copper Sulphate.		
Borax Crystals (Sodium Biborate), Barrels	lb.	.06
Calcium Carbonate (Precipitated Chalk)	lb.	.04
Carbon Bisulphide, Drums	lb.	.07
Chrome Green	lb.	.36
Cobalt Chloride	lb.	—
Copper—		
Acetate	lb.	.37
Carbonate, Barrels	lb.	.20
Cyanide	lb.	.46
Sulphate, Barrels	lb.	.06½
Copperas (Iron Sulphate, bbl.)	lb.	.02
Corrosive Sublimate, see Mercury Bichloride.		
Cream of Tartar, Crystals (Potassium bitartrate)	lb.	.27
Crocus	lb.	.15
Dextrin	lb.	.05–.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluor-spar (Calcic fluoride)	ton	$75.00
Fusel Oil	gal.	5.50
Gold Chloride	oz.	14.00
Gum—		
Sandarac	lb.	.26
Shellac	lb.	.82–1.00
Iron, Sulphate, see Copperas, bbl.	lb.	.02
Lead Acetate (Sugar of Lead)	lb.	.13
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	1.15
Nickel—		
Carbonate Dry	lb.	.40
Chloride, 100 lb. lots	lb.	.22½–.40
Salts, single, bbls	lb.	.11½
Salts, double, bbl	lb.	.10½
Parrafin	lb.	.05–.06
Phosphorus—Duty free, according to quantity		.35–.40
Potash, Caustic, Electrolytic 88-92% fused, drums	lb.	.09
Potassium Bichromate, casks	lb.	.12
Carbonate, 80-85%, casks	lb.	.06
Cyanide, 165 lb. cases, 94-96%	lb.	.65
Pumice, ground, bbls	lb.	.02½
Quartz, powdered	ton	$30.00
Official	oz.	—
Rosin, bbls.	lb.	.03½
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.08
Silver Chloride, dry	oz.	.86
Cyanide	oz.	—
Nitrate, 100 ounce lots	oz.	.46
Soda Ash, 58%, bbls	lb.	.02½
Sodium—		
Biborate, see Borax (Powdered), bbls	lb.	.06
Cyanide, 96 to 98%, 100 lbs	lb.	.23
Hyposulphite, kegs	lb.	.04
Nitrate, tech. bbls	lb.	.03
Phosphate, tech., bbls	lb.	.03¾
Silicate (Water Glass) bbls	lb.	.02
Sulpho Cyanide	lb.	.45
Soot, Calcined	lb.	—
Sugar of Lead, see Lead Acetate	lb.	.12–13
Sulphur (Brimstone) bbls	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.36
Tripoli	lb.	.03
Verdigris, see Copper Acetate	lb.	.37
Water Glass, see Sodium Silicate, bbls	lb.	.02½
Wax—		
Bees, white ref. bleached	lb.	.55
Yellow, No. 1	lb.	.35
Whiting, Bolted	lb.	.02½–.06
Zinc Carbonate, bbls	lb.	.13–.17
Chloride, 600 lb. lots	lb.	.07
Cyanide	lb.	.37
Sulphate, bbls.	lb.	.03¾

COTTON BUFFS

Open buffs, per 100 sections (nominal).

12 inch, 20 ply, 64/68, cloth	base,	42.95
14 inch, 20 ply, 64/68, cloth	base,	53.40
12 inch, 20 ply, 84/92, cloth	base,	51.05
14 inch, 20 ply, 84/92, cloth	base,	68.80
12 inch, 20 ply, 88/96, cloth	base,	58.35
14 inch, 20 ply, 88/96, cloth	base,	78.60
Sewed Buffs, per lb., bleached and unbleached	base,	.60

FELT WHEELS

		Price Per Lb. Less Than 100 Lbs.	300 Lbs. and Over
Diameter—10″ to 16″	1″ to 3″	2.75	2.50
" 6″ 8″ and over 16″	1″ to 3″	2.85	2.60
" 6″ to 24″	Over 3″	3.15	2.80
" 6″ to 24″	½″ to 1″	3.75	3.50
" 4″ to 6″	¼″ to 3″	4.75	Any quantity.
" Under 4″	¼″ to 3″	5.35	

Grey Mexican or French Grey—10c. less per lb. than Spanish, above. Odd sizes, 50c. advance.